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HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D. C., 2 September 1970

**DS, GS, AND Depot Maintenance Manual
RADIO SET AN/ARC-54 AND CONTROL INDICATOR C-8157/ARC**

TM 11-5821-244-35, 17 November 1965, is changed as follows:

1. This change reflects the incorporation of the CU-942B/ARC-54 Antenna Coupler.
2. New or changed material is indicated by a vertical bar.
3. Remove old pages and insert new pages as indicated in the page list below.

Remove pages—**Insert pages—**

1-1 through 1-4.....	1-1 through 1-4
1-59 and 1-60.....	1-59 and 1-60
1-63 and 1-64.....	1-63 and 1-64 and 1-64.1
1-73 through 1-76.....	1-73 through 1-76 and 1-76.1
4-13 and 4-14.....	4-13 and 4-14
.....	4-78.1 and 4-78.2

4. File this change sheet in front of the publication for reference purposes.

Schematics

Low freq osc 1-7 pg 1-15
RF PWR Amp 1-9 pg 1-19
Power Supply 1-26 pg 1-43

6-8
6-9
6-10
6-5
6-11
6-12

6-13
6-14
6-15
6-16
6-17
6-18
6-20

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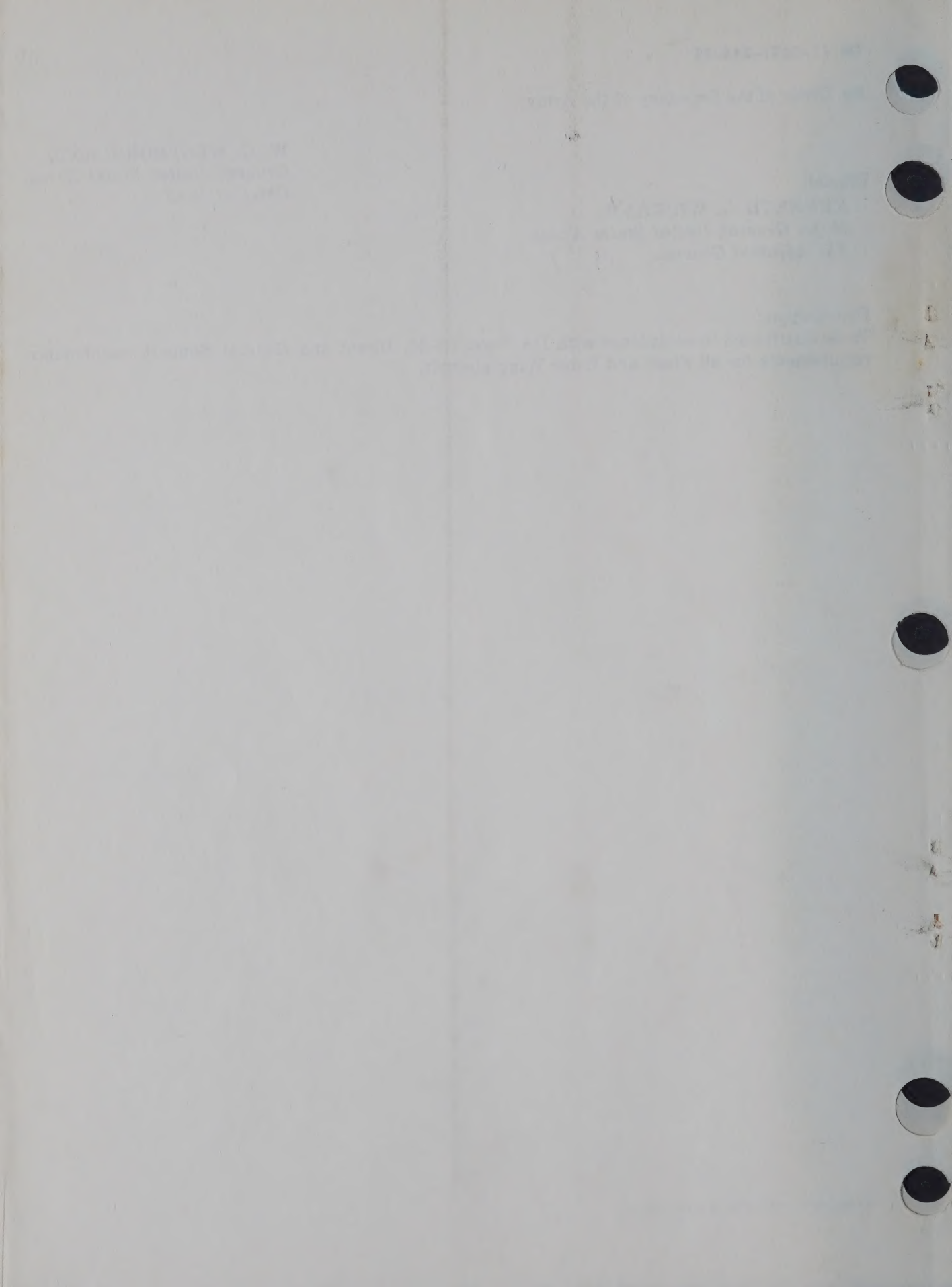
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DS, GS, and Depot Maintenance Manual
RADIO SET AN/ARC-54 AND CONTROL INDICATOR
C-8157/ARC

TM 11-5821-244-35, 17 November 1965, is changed as follows:

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2. Remove and insert pages as indicated below.

Remove—	Insert—
1-13-1-14	1-13-1-14
	4-60.3
5-5-5-8	5-5-5-8
-----	5-13.1-5-13.2
5-15-5-17	5-15-5-17
5-19	5-19
5-25	5-25
	5-27.1-5-27.2
5-38	5-38
6-11-6-12	6-11, 6-13, 6-13.1
6-18	6-19
6-20	6-21

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U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
WASHINGTON, D. C. 20246

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CHAPTER 1

CIRCUIT FUNCTIONING

Section I. GENERAL PRINCIPLES OF RADIO SET AN/ARC-54

1-1. Scope

a. This manual contains instructions for direct support (DS), general support (GS), and depot maintenance for Radio Set AN/ARC-54 (radio set). It includes instructions appropriate to DS, GS, and depot support for troubleshooting, testing, aligning, and repairing the radio set. It also lists tools, materials, and test equipment for DS, GS, and depot maintenance. Detailed circuit functioning of the equipment is covered in the stage analysis section.

b. The reporting of errors, omissions, and recommendations for improving this publication by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded direct to Commanding General, U.S. Army Electronics Command, ATTN: AMSEL-MR-(NMP)-MA, Fort Monmouth, N.J., 07703.

NOTE

For applicable forms and records, refer to TM 11-5821-244-12.

c. Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

d. Refer to the latest issue of DA Pam 310-7 to determine whether there are modification work orders (MWO's) pertaining to the equipment.

1-2. Set Applications

a. Radio Set AN/ARC-54 provides two-way voice communications between aircraft in flight and between aircraft and ground stations. The

radio set is a double-conversion, superheterodyne, frequency-modulated (fm) receiver-transmitter with 800 crystal-controlled channels in the frequency range of 30 to 69.95 megacycles (mc). Channel separation is 50 kilocycles (kc). The radio set can be used as a standard fm receiver-transmitter operating with or without carrier squelch or with tone squelch. The radio set may also be used as a homing receiver or as a part of a retransmit (airborne radio relay) system. Operation of the radio set is entirely remote controlled. The operator has the choice of any of the 800 channels. Manual selection of any of the channels may be accomplished by the rotation of two selectors on Control, Radio Set C-3835/ARC-54 (control unit) until the desired frequency appears in the indicator window. A motor in Receiver-Transmitter, Radio RT-348/ARC-54 automatically tunes the radio set to the frequency setting on the control unit. The control unit also contains a volume control, a squelch mode selector, and an operation mode selector, which enables the operator to select the following functions: push-to-talk, retransmit, or homing.

b. The radio set provides right-left, flag alarm, and signal strength information when used with a homing antenna system and a homing indicator. The homing facilities of the radio set enable the pilot of an aircraft to fly direct to any transmitter operating on any of the 800 channels within the frequency range of 30 to 69.95 mc.

c. Two Radio Sets AN/ARC-54 may be connected as an unattended two-way relay station to allow two stations in the range of the aircraft, but beyond the operating range of each other, to communicate. The two radio sets that make up the relay station are tuned to different frequencies. The radio set first receiving the signal automatically couples the signal into the second radio set for relay to the other station.

1-3. Transmit Operation

(fig. 1-1)

Figure 1-1 is a simplified block diagram of Radio Set AN/ARC-54 and associated equipment required for operation as a communications receiver-transmitter or a homing receiver. The receiver and transmitter circuits are in Receiver-Transmitter, Ratio RT-348/ARC-54. The homing antennas, microphone-headset, aircraft interphone, and homing indicator are not a part of the radio set but are additional equipment required for normal operation. When the push-to-talk switch is depressed, the audio signal generated by the microphone is routed to the receiver-transmitter unit through the aircraft interphone and Control, Radio Set C-3835/ARC-54. In the receiver-transmitter unit, the audio signal is amplified and applied to an fm modulator, which varies the frequency of a 500-kc oscillator in accordance with the incoming audio signal. The frequency-modulated output of the 500-kc oscillator is combined in a mixer with a signal from a low-frequency local oscillator to produce a first intermediate frequency (IF) signal. This signal is amplified and combined in a second mixer with a signal from a high-frequency local oscillator to produce a radiofrequency (RF) signal. The RF signal is then fed through the RF driver and power amplifier stages and a harmonic-suppression filter to the antenna coupler. The antenna coupler matches the impedance of

the receiver-transmitter to Antenna AS-1703/AR.

1-4. Receiver-Operation

(Fig. 1-1)

a. The frequency-modulated communications signal is intercepted by the communications (or homing) antenna and routed to Receiver-Transmitter, Radio RT-348/ARC-54 through the antenna coupler. In the receiver-transmitter unit, the fm signal is amplified and then mixed with a high-frequency local oscillator signal to produce a variable IF signal. This signal is amplified and combined with a second (low-frequency) local oscillator signal to produce a lower IF signal, which is further amplified in a selective (500 kc) amplifier, and detected to produce an audio signal. The audio signal is fed through the audio driver and power amplifier stages to Control, Radio Set C-3835/ARC-54. From the control unit, the audio signal is fed through the aircraft interphone to the headset-microphone.

b. An additional function of the radio set is the homing facility. The homing signal, which may be an fm signal or an unmodulated carrier signal in the frequency range of the radio set, is intercepted by the homing antenna system and coupled to Receiver-Transmitter, Radio RT-348/ARC-54. The receiver-transmitter unit alternately samples the signal at each antenna and produces a polarized signal that is indicative of the aircraft head-

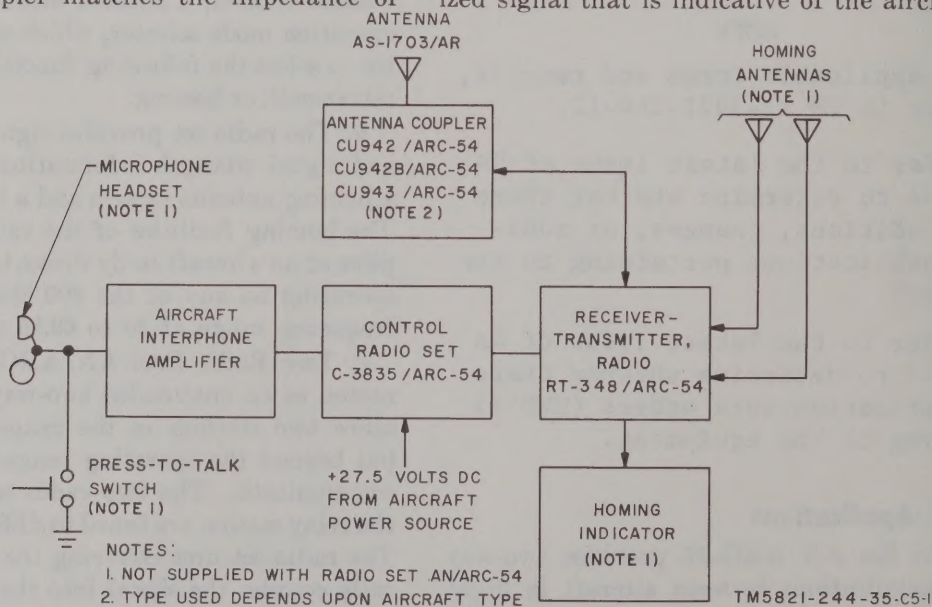


Figure 1-1. Radio Set AN/ARC-54, functional block diagram.

ing in relation to the transmitting station. This signal is routed to the aircraft homing indicator.

Normal fm communications are possible during homing operations.

Section II. BLOCK DIAGRAM ANALYSIS OF RECEIVER-TRANSMITTER, RADIO RT-348/ARC-54

1-5. Introduction

(fig. 6-2)

Receiver-Transmitter, Radio RT-348/ARC-54 receives and transmits frequency-modulated signals in the frequency range of 30 to 69.95 mc. The receiver-transmitter unit is a combination double-conversion superheterodyne receiver and transmitter. The tuning system, the local oscillators, and tuned RF and IF amplifiers are shared by the transmitter and receiver. The receiver-transmitter unit, when used with Control, Radio Set C-3835/ARC-54, Antenna AS-1703/AR, Antenna Coupler CU-942/ARC-54 (or CU-943/ARC-54), and a microphone-headset, provides two-way voice communications between aircraft in flight and between aircraft and ground stations.

NOTE

Antenna Coupler CU-942B/ARC-54 is one-way interchangeable with Antenna Coupler CU-942/ARC-54.

In addition to two-way voice communications, the receiver-transmitter unit contains additional circuits that provide homing and retransmit (radio relay) operations. Figure 6-2 is a block diagram of the receiver-transmitter unit arranged in relation to the actual signal paths through the unit. For simplicity, the modular plug-in units are broken down into stages. Solid lines in the figure represent the signal path during receiver operations, the long dashed lines represent the signal path for transmit operations, and the long and short dashed lines represent the homing signal path. For complete circuit details, refer to the schematic diagrams. The transmit, receive, and homing signal paths are described on a block-diagram level in paragraphs 1-6, 1-7, and 1-8. The retransmit signal path is described in paragraphs 1-92 and 1-93. A detailed stage analysis for the receiver-transmitter unit is given in paragraphs 1-9 through 1-63.

1-6. Transmitting Signal Path

(fig. 6-2)

a. The push-to-talk switch on the operator's microphone (not shown on block-diagram) controls

the relay and switching circuits that select, receive, or transmit operation. When the operator presses the push-to-talk switch, diode switches connect the high-and low-frequency oscillator signals to the transmitter mixer stages. Antenna relay K1002 connects the communications antenna to the reflectometer circuit at the output of the transmitter. The audio signal enters the receiver-transmitter unit at the audio input terminals and passes through an audio preemphasis network to audio amplifier Q1401. The audio preemphasis network is a high-pass filter that improves the signal-to-noise ratio of the higher audio signals to permit reception of these signals without excessive noise. (A part of the audio signal from the preemphasis network also passes through sidetone switch CR1403 to audio driver amplifier Q1304 for sidetone amplification.) Audio amplifiers Q1401 and Q1402 raise the audio signal voltage to a level suitable for driving the fm modulator-oscillator C1415, Q1403. Without an audio signal, the oscillator produces a constant 500-kc signal. The audio-frequency (AF) voltage impressed across the variable capacitance diode in the frequency control circuit of the oscillator changes the frequency of the oscillator at a rate equal to the frequency of the audio signal. The magnitude of this frequency change is proportional to the amplitude of the audio signal. The fm signal is then coupled to mixer/amplifier Q501, which combines the 500-kc fm signal with the signal from low-frequency oscillator Q401. The mechanical drive assembly selects the operating frequency of the low-frequency oscillator (lfo) by inserting 1 of 20 crystals into the oscillator. The oscillator provides 20 injection signals within the frequency range of 4.475 to 5.425 mc. These injection signals pass through the low-frequency oscillator diode switch to the mixer/amplifier. The resulting mixer output, a variable IF signal in the frequency range of 3.975 to 5.925 mc, passes through variable IF amplifier Q502 to transmitter mixer S604. The mixer combines the variable IF signal with the injection sig-

nal from crystal-controlled high-frequency oscillator Q301. The high-frequency oscillator (hfo) produces 20 frequencies within the frequency range of 26.025 and 64.025 mc. These injection signals pass through the high-frequency oscillator diode switch to the mixer. (In transmit operation, the hfo diode switch connects the output of the hfo to transmitter mixer Q604; in receive operation, the hfo switch connects the hfo to receiver mixer Q605.) The resulting mixer output, within the frequency range of 30 to 69.95 mc, passes through three rf amplifier stages, Q601, Q602, and Q603, two vacuum-tube amplifiers (voltage amplifier V801 and driver amplifier V802) and a power amplifier (V803) to the harmonic filter. The filter attenuates harmonics of the fundamental frequency. The filtered RF signal passes through the reflectometer circuit and energized antenna relay, K1002, to the communications antenna output terminal. The reflectometer circuit samples and detects forward and reflected energy on the radio set transmission lines and applies this energy sample to the TEST METER (not shown), on the front panel of the receiver-transmitter unit, to indicate the transmitting efficiency of the radio set and antenna system.

b. The sidetone control rectifier, CR1603 and CR1604, rectifies a portion of the RF signal from power amplifier V803 and supplies the resulting direct-current (dc) level to sidetone switch CR1403. This dc level biases the sidetone switch to allow the audio signal from the audio preemphasis network to pass through audio driver amplifier Q1304 and audio power amplifier Q1305 and Q1306 to the audio output terminal of the receiver-transmitter unit.

c. The selective calling circuits allow selected radio sets to participate in group communications. When the push-to-talk switch is depressed, tone generator/selective amplifier Q102, Q103 operates as a 150 cycle-per-second (cps) oscillator. The tone is then applied to the modulator portion of fm modulator-oscillator C1415, Q1403, where it modulates the 500-kc oscillator signal in addition to the normal audio modulating signal from the preemphasis network. If another radio is operating in TONE squelch mode, it will receive only signals containing the 150-cps modulation.

d. When the radio set is used with an external security device, the encoded transmit signal from

the security device goes directly to the modulator portion of fm modulator-oscillator C1415, Q1403 instead of passing through the normal signal path. The encoded signal frequency modulates the 500-kc oscillator. The remainder of the signal path is identical with the normal transmit signal path described in *a* through *c* above. During security operations, the sidetone is provided by the security device and the output of tone amplifier Q104 is grounded out.

e. Two frequency selector knobs on the control unit select the operating frequency of the receiver-transmitter unit. The whole-megacycle selector knob selects frequencies from 30 to 69 mc in 1-mc steps, the decimal-megacycle selector knob selects frequencies from 0.00 to 0.95 mc in 0.05-mc steps. The mechanical tuning system automatically inserts the proper crystals in the high- and low-frequency oscillator circuits and tunes the tank circuits in the variable IF, RF, and power amplifier stages to correspond to the frequency selected on the control unit.

f. The power supply provides operating voltages for both the transmit and receive circuits. It consists of the following stages: despiking circuit Q1501, Q1504, 54-volt AC inverter Q1502, Q1503, the -27.5-volt dc power supply, and the high-voltage power supply (+250 volts DC and +500 volts DC). Despiking circuit Q1501, Q1504 removes positive spikes from the primary dc power supply to provide filtered +27.5 volts dc for transmitter and receiver stages and chassis-mounted components. The 54-volt inverter uses the +27.5-volts from the despiking network to produce a 54-volt, 800 cps ac voltage. During channel-changing operations, the mechanical drive assembly connects this 800-cps signal to audio driver amplifier Q1304 to provide a channel-changing tone to the radio set operator. The high-voltage power supply steps up and rectifies the alternating-current (ac) voltage from the 54-volt inverter to produce plate and screen voltages (+250 and +500 volts dc) for the three vacuum-tube RF power amplifier stages, V801, V802, and V803. The -27.5-volt dc power supply rectifies the 54 volts ac to develop the -27.5 volts dc, which is used to bias the diode switches and the vacuum-tube amplifiers.

1-7. Receiving Signal Path

(fig. 6-2)

a. The receiver circuits in Receiver-Transmitter, Radio RT-348/ARC-54 are activated when the push-to-talk switch is not depressed. The RF signal, in the frequency range of 30 to 69.95 mc, enters the receiver-transmitter unit at the communications antenna input terminal, passes through antenna relay K1002, communications homing relay K202, and RF amplifiers Q601, Q602, and Q603, to receive mixer Q605. (Relay K202 connects the input terminal RF amplifier Q601 to either the communications antenna relay K1002 or to the homer switch, depending on the mode of operation.) The receiver mixer, Q605, combines the RF signal with the 26.025- to 64.025-mc injection signal from the crystal-controlled hfo, Q301, to produce a variable IF signal in the range of 3.975 to 5.925 mc. The hfo signal passes through the hfo diode switch to the receiver mixer. The resultant mixer output passes through mixer/amplifier Q501, which operates as an amplifier in receive operation, and variable IF amplifier Q502 to receiver mixer Q503. This mixer combines the variable IF signal with the 4.475- to 5.425-mc signal from the lfo, Q401, to produce a fixed IF signal of 500 kc. The lfo signal is applied to the receiver mixer through the lfo diode switch. The 500-kc IF signal from the receiver mixer passes through bandpass filter FL1201 and four fixed IF amplifiers, Q1201, Q1202, Q1203, and Q1204, to limiter Q1205. The bandpass filter provides good selectivity characteristics for the following amplifier stages. Limiter Q1205 is basically an amplifier designed so that, at a certain level, a further increase in input signal produces no change in the amplitude of the output signal. This removes amplitude variations from the IF signal, thereby insuring a signal of constant amplitude free of noise and amplitude-modulated (am) interference. Since the fm discriminator responds only to frequency variations, the intelligence contained in the modulation is not affected. Although the limiter provides some amplification, its main purpose is to limit the amplitude variations caused by signal fading and noise. Fm discriminator diodes CR1204 and CR1205 detect the audio signal and apply it to audio preamplifier Q1301. (Sel-call preamplifier Q101 also receives a portion of the

audio signal and uses it to develop the squelch signal.) The audio preamplifier increases the level of the audio signal and applies it to audio gate Q1302, Q1303. The audio gate is a switching circuit that either blocks or passes the audio signal, depending upon the squelch action. Audio driver amplifier Q1304 and audio power amplifiers Q1305 and Q1306 amplify the audio signal to provide satisfactory sound volume.

b. Automatic gain control (agc) in the receiver-transmitter unit provides a uniform output from a signal of varying strength. The agc circuit controls the gain in several IF and RF amplifier stages preceding the fm discriminator. Agc detector CR1201 receives the IF signal from fixed IF amplifier Q1204 and develops a dc voltage that varies with the strength of the incoming signal. Agc amplifiers Q1209, Q1206, and Q1210 amplify the detector output voltage and provide a gain-adjusting bias voltage to variable IF amplifier Q502, fixed IF amplifiers Q1201, Q1202, and Q1203, and RF amplifiers Q601 and Q602.

c. The receiver-transmitter unit contains a squelch circuit, which removes the background noise from the receiver audio output when no signal is present. The squelch circuits block the audio output from the receiver-transmitter unit when no signal is present, but allows the receiver-transmitter unit to operate normally when a signal is present. The receiver-transmitter unit also contains a tone-operated squelch circuit that allows messages to be received only when a 150-cps audio tone is present.

- (1) In normal carrier squelch operation, sel-call preamplifier Q101 receives the noise and audio signals from the fm discriminator, amplifies the signals, and applies them to noise amplifier Q105 through a high-pass circuit (not shown in fig. 1-2) that presents a high impedance to signals in the speech range. Noise amplifiers Q105, Q106, and Q107 amplify the noise voltage and apply it to the voltage tripler. The voltage tripler simultaneously multiplies and rectifies the signal and applies it to audio gate Q1302, Q1303 for use as a control voltage. With no RF signal present, audio background noise to the noise amplifier is applied to the voltage tripler circuit, the output of which closes

the audio gate to prevent the signal from reaching the output of the receiver-transmitter unit. In the presence of an RF carrier, audio background noise is reduced by limiting action, causing insufficient noise voltage to be applied to the voltage tripler, thus opening the audio gate and connecting the audio signal from the fm discriminator to the audio driver amplifier Q1304.

- (2) In tone-squelch operation, sel-call pre-amplifier Q101 receives the audio, tone, and noise signals from the fm discriminator, amplifies the signals, and applies them to tone generator/selective amplifier Q102, Q103. In the receive condition, this dual-purpose stage operates as a selective amplifier. It amplifies the 150-cps component of the received signal and applies it to tone amplifier Q104 while rejecting other signal components. Tone amplifier Q104 amplifies the signal and applies it to the voltage tripler which detects and multiplies the signal and applies a dc voltage to audio gate Q1302, Q1303, which opens the gate, thereby allowing the audio signal to pass. When the radio set is operating in the tone-squelch mode and when the 150-cps tone is not present in the fm discriminator output, the audio gate is closed, thereby allowing no audio signal to pass through to the audio driver amplifier stage.

d. When the radio set is used with an external security device, security amplifiers Q1207 and Q1208 amplify the detected, encoded signal from the fm discriminator and apply it to the external security device for decoding.

1-8. Homing Signal Path

(fig. 6-2)

a. Homing operation is available on any of the 800 channels in the frequency range of 30.00 to 69.95 mc. The homing circuit provides informa-

tion to the aircraft homing indicator concerning the heading of the aircraft with respect to a transmitting station. A controlled-pattern antenna system intercepts the homing signal. The homer switch alternately samples the signal from first one and then the other antenna at a 100-cps rate. The resultant signal has two components. When the aircraft heading is aligned with the transmitting station, these signal components have the same signal strength. However, when the aircraft heading is to either side of the transmitting station, the strength of one component increases and the strength of the other component decreases. The composite homing signal passes through relay K202 to RF amplifier Q601. The homing signal path is identical with the receive signal path from RF amplifier Q601 through fixed IF amplifier Q1203. The signal then takes a separate path as indicated by the combination dashed and dotted lines in the block diagram.

b. The 500-kc homing amplifier, Q204, amplifies the signal from fixed IF amplifier Q1203 and applies it to homing detector CR205 and CR206, which is sensitive only to amplitude variations. The 100-cps homing amplifier, Q205, amplifies the detected signal and applies it to contacts of mechanical chopper K201, which switches the signal between two homing output terminals at a 100-cps rate. The 100-cps oscillator, Q201, Q206, drives both the homer switch and mechanical chopper. The switching action of the two circuits is synchronized so that the sampled signal from one antenna is always applied to one output terminal and the signal from the other antenna is applied to the other output terminal. The aircraft homing indicator uses these signals to provide a visual indication of the aircraft heading relative to the homing station. If the two signals have the same strength, the homing indicator indicates that the aircraft is on course. If one signal has greater amplitude than the other, the homing indicator indicates the direction in which the aircraft must fly to assume an on-course heading.

c. Homing signal-strength amplifier Q203 amplifies the age voltage and applies it to the aircraft homing indicator to provide a visual indication of relative signal strength.

d. The squelch circuit supplies a flag alarm ground to the homing indicator. When the audio

gate, Q1302, Q1303, opens, it supplies a dc signal to retransmit switch Q1307 which energizes relay K1301 (not shown). When energized, this relay supplies a ground to the homing indicator to drop

the flags. When the relay is deenergized, the alarm flags raise, indicating that the homing signal is too weak to provide proper homing information to the homing indicator.

Section III. STAGE ANALYSIS FOR RECEIVER-TRANSMITTER, RADIO RT-348/ARC-54

1-9. General

The following paragraphs provide a stage-by-stage detailed analysis of the receiver-transmitter unit circuits. The paragraphs are arranged so that the stages are discussed in the order of signal flow when the radio set is in transmit mode. Stages that have no particular position with respect to the transmit signal flow pattern and stages that perform special functions, not part of normal transmit operation, are presented after stages in the direct path of signal flow. Some stages are active in both transmit and receive conditions and are discussed in transmit-signal-flow order. Some stages have dual purpose; that is, they perform one function in transmit mode and another function in receive mode. These are presented in transmit-signal-flow-order and their transmit and receive functions are discussed separately.

1-10. Audio Preemphasis Circuit

(fig. 1-2)

The preemphasis circuit boosts audio response at the higher audiofrequencies so that random noise will not dominate that portion of the spectrum. The preemphasis circuit consists of resistors R1401 through R1405 and capacitor C1401. The preemphasis circuit is used by connecting jumper A. When jumper A is connected, capacitor C1401 and resistors R1403 and R1405 form a high-pass filter, which couples high audiofrequencies to transformer T1401 more readily than low frequencies. The lowest frequency at which preemphasis begins is determined by the value of resistor R1403, and the high end of preemphasis is determined by the value of resistor R1405. When preemphasis is not used, jumper A is disconnected and jumper B is connected. Jumper B connects resistor R1404 into the input circuit to simulate the load presented by capacitor C1401 when preemphasis is used. Potentiometer

R1402 adjusts the amplitude of audio input. Resistor R1401 assures the required minimum audio input level.

1-11. Audio Amplifiers Q1401 and Q1402

(fig. 1-2)

The audio signal from the preemphasis circuit is coupled through transformer T1401 and coupling capacitor C1402 to the base of transistor Q1401. Transistor Q1401 provides audio amplification. Base bias for Q1401 is supplied through voltage divider comprising resistors R1406 and R1407. Emitter swamping resistors R1409 and R1410 are bypassed by capacitors C1404 and C1405 to provide selective degeneration (low frequencies are degenerated more than high frequencies). Resistor R1408 is the collector-load resistor. The amplified audio signal is coupled from the collector of Q1401, through coupling capacitor C1406 to the base of second audio amplifier transistor Q1402. Base bias for Q1402 is supplied through the voltage divider comprising resistors R1418 and R1419. Resistors R1416 and R1417 are emitter swamping resistors. Resistor R1416 is bypassed by capacitor C1408 to minimize degeneration. Some degeneration is allowed by unbypassed resistor R1417 to provide gain stability. Resistor R1423 is the collector-load resistor for Q1402. The amplified audio is coupled from the collector of Q1402, through coupling capacitor C1424, to the fm modulator-oscillator circuit.

1-12. Sidetone Switch

(fig. 1-2)

A sample of the audio signal from the preemphasis circuit is coupled from the secondary winding (terminals 5 and 6) of transformer T1401 and used as sidetone audio. The signal is coupled through coupling capacitor C1403 to the cathode end of diode switch CR1403. Diode CR1403 is

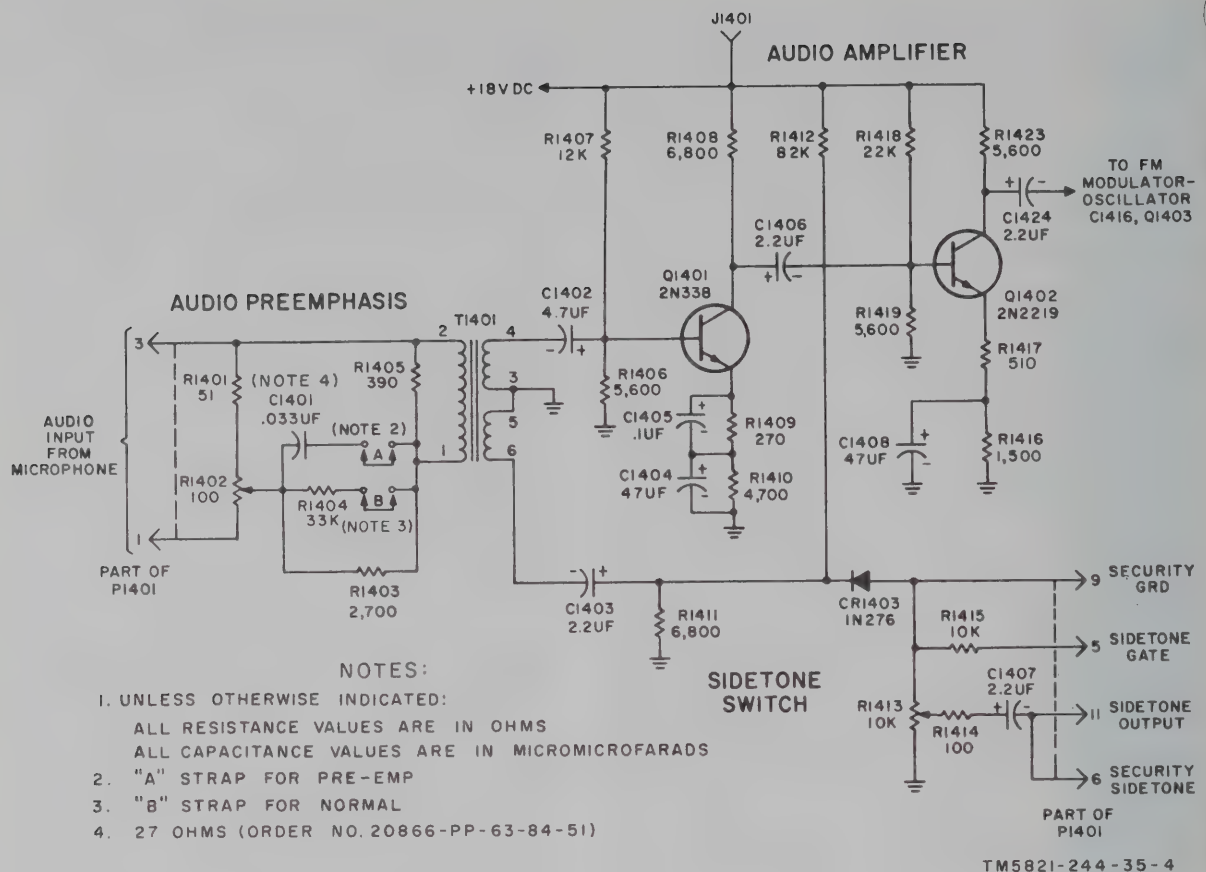


Figure 1-2. Audio preemphasis and amplifier circuits, schematic diagram.

normally reversed biased by the voltage divider consisting of resistors R1411 and R1412. When the transmitter is keyed, a portion of the carrier signal is rectified, in the harmonic filter module, to provide a positive dc potential at pin 5 of the transmit audio module. This voltage is called the sidetone gate because it causes current flow through resistors R1413 and R1415, forward-biasing diode switch CR1403. With CR1403 conducting, the audio sidetone signal is coupled through CR1403 and developed across resistor R1413. The audio sidetone signal is coupled out through the wiper arm of R1413, fixed resistor R1414, and coupling capacitor C1407 to pin 11 of transmit audio module connector P1401. Resistor R1413 adjusts the level of the sidetone signal and resistor R1414 prevents overloading of transformer T1401.

1-13. Fm Modulator-Oscillator C1415, Q1403 (fig. 1-3)

The amplified audio signal from Q1402 is coupled, through coupling capacitor C1424 (fig. 1-2) and series dropping resistor R1426, to the fm modulator-oscillator circuit. The fm modulator-oscillator converts the amplitude-modulated signal to a 500-kc signal, which is frequency modulated at the frequency of the audio signal. Capacitor C1415 is a voltage-variable silicon capacitor, which functions as a modulator. The capacitance of C1415 varies inversely by a factor of the voltage applied. Variable capacitor C1415 is reverse biased from the voltage-divider regulator consisting of resistors R1424 and R1425

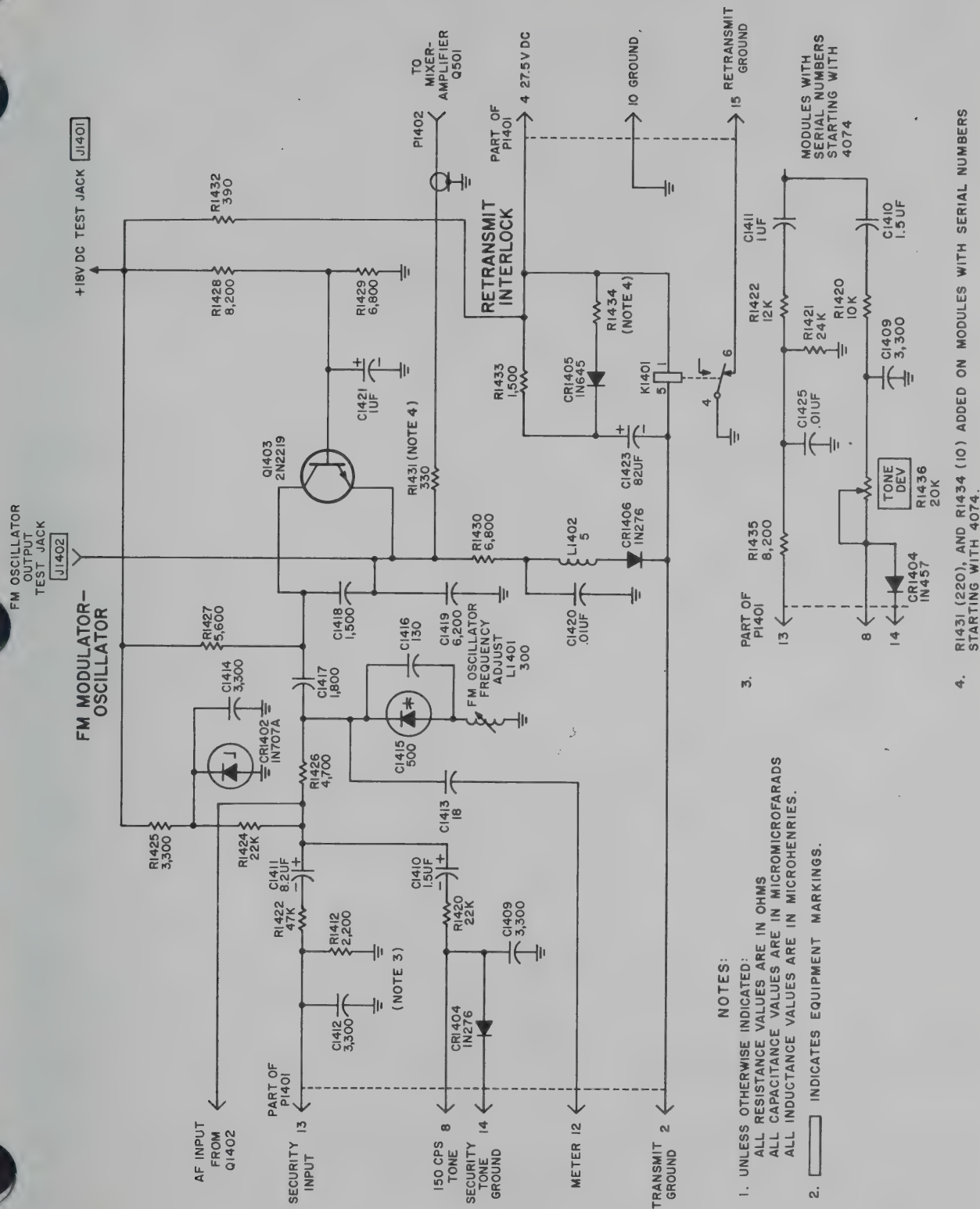


Figure 1-9. Fm modulator-oscillator and retransmit interlock circuits, schematic diagram.

and Zener diode CR1402. Capacitor C1414 filters the bias supply. Variable capacitor C1415 is part of a tank circuit, which is resonant at 500 kc. The tank circuit consists of capacitors C1415 through C1419 and variable inductor L1401. Inductor L1401 adjusts the center frequency of the tank to 500 kc. Transistor Q1403 provides the gain for the oscillator. Feedback is through capacitor C1418. Resistor R1427 is the collector-load resistor for Q1403. Base bias for Q1403 is supplied through the voltage divider comprising resistors R1428 and R1429. Capacitor C1421 is a filter capacitor. The oscillator is turned on by the transmit ground at pin of P1401. The transmit ground, applied when the transmit button is depressed, provides a conduction path for Q1403 through diode CR1406, inductor L1402, and emitter-biasing resistor R1430. Inductor L1402 and capacitor C1420 prevent 500-kc oscillations from coupling into the transmit bus. Diode CR1406 prevents reverse current flow through the emitter-base junction of Q1403. The frequency-modulated signal is coupled from the emitter of Q1403, through series dropping resistor R1431, to connector P1402. The signal is then coupled through a coaxial cable to mixer/amplifier Q501 in the variable IF amplifier module.

1-14. 150-Cps Tone and Security Injection Circuit

(fig. 1-3)

The fm modulator-oscillator is modulated by a 150-cps tone, coupled from pin 8 of P1401 through tone deviation adjustment R-1436¹, series resistor R1420 and coupling capacitor C1410 to the variable capacitor bias circuit. The tone is applied at the junction of resistors R1424 and R1426 to provide the proper tone injection level. Resistor R1420 and capacitor C1409 provide filtering. Security input is from pin 13 of P1401 through resistor R1422 and coupling capacitor C1411. Resistor R1421 and capacitor C1412 provide filtering. When the security input is used, the 150-cps tone is grounded through diode CR1404. *MWO 11-5821-244-30/2 is applied to provide Mode(X) operation. (Fig. 6-10)*

1-15. Retransmit Interlock, K1401

(fig. 1-3)

Relay K1401, resistor R1433, and R1434¹ diode CR1405, and capacitor C1423 form a retransmit control interlock circuit. The relay energizes, removing the

retransmit ground from pin 15 of P1401 when a transmit ground is applied at pin 2 of P1401. This assumes that, while one receiver-transmitter unit of a retransmit system is transmitting, the other receiver-transmitter unit will not transmit. When the ground is applied at pin 2 of P1401, energizing K1401, capacitor C1423 charges rapidly through diode CR1405 and re-resistor R1434¹. When the transmit ground is removed, the relay remains energized for a short time due to the relatively slow discharge of capacitor C1423 through relay winding and resistor R1433. The delay prevents retransmit oscillations. (Refer to paras. 1-92 and 1-93 for an overall discussion of retransmit operation.)

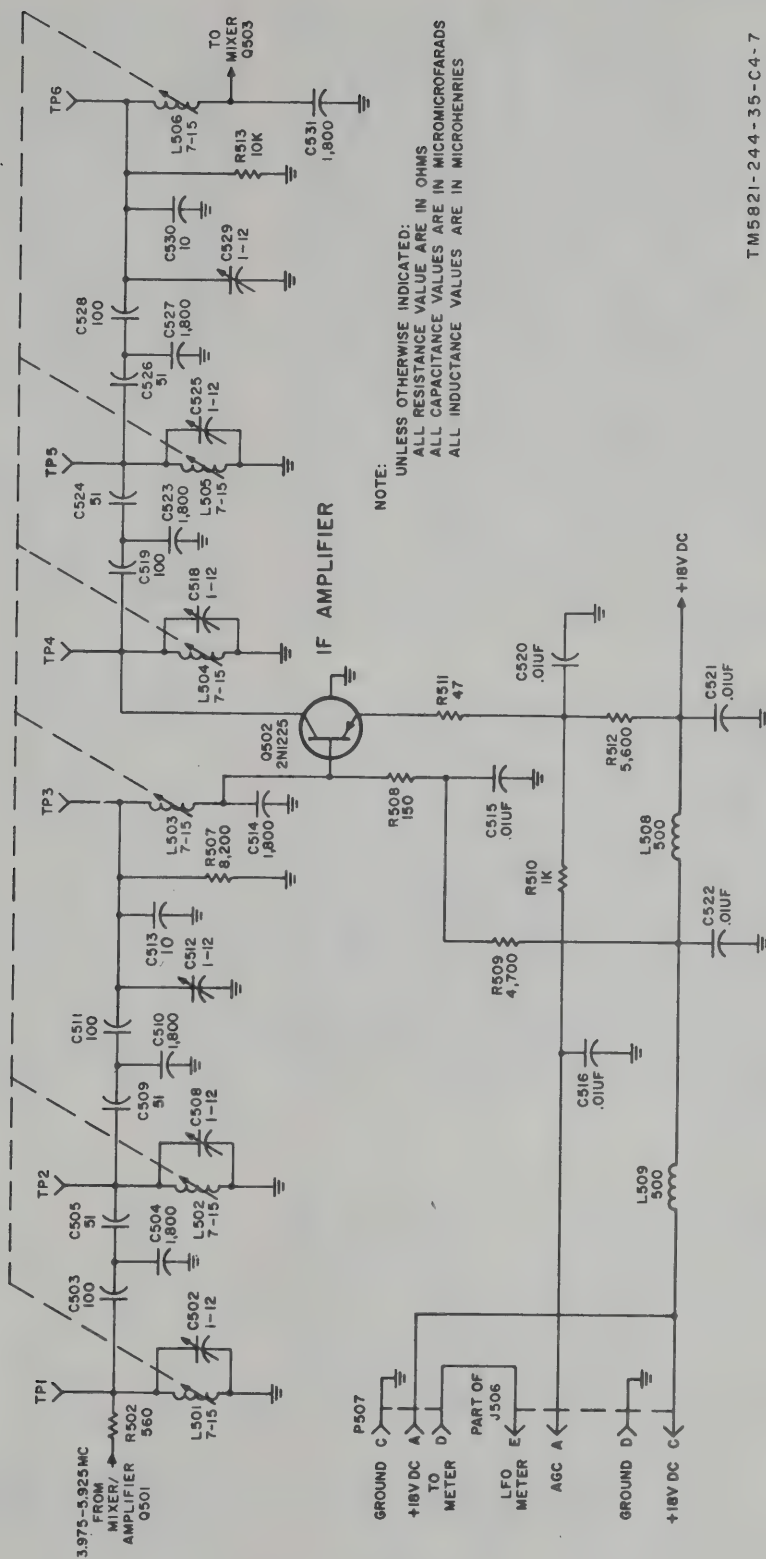
1-16. Lfo Diode Switch

(fig. 1-4)

The lfo diode switch selects the proper path for the low-frequency oscillator signal. The diodes are biased so that the low-frequency oscillator signal is coupled to mixer Q503 in the receive condition, and to mixer/amplifier Q501 in the transmit condition. The diode switch consists of diodes CR501 through CR507; capacitors C517, C536, C537, and C539; and resistors R519 through R526. Diode biasing voltage is supplied from the transmit-receive (tr) bus (pin B of connector J506). The tr bus voltage is +27.5 volts in the receive condition and -27.5 volts in the transmit condition.

a. Receive Condition. In the receive condition, the tr bus is +27.5 volts. Current flows through resistors R526 and R525. The resulting voltages at the cathode ends of diodes CR504 and CR506 are less positive than the voltages at the anode ends and CR504 and CR506 conduct through resistors R526, R523, and R522, completing a path for the low-frequency oscillator signal to be coupled, through coupling capacitors C536 and C538, to mixer transistor Q503. The voltages described above reverse-bias diodes CR507 and CR505 so that they do not couple the low-frequency oscillator signal to ground. Current flow through diodes CR506 and CR504 and resistors R526 and R522 causes a positive voltage at the cathode end of diode CR503. The anode end of CR503 is practically at ground potential because of conduction of diode CR502 through resistor R521. Diode CR503 is thus reverse-biased so that

¹ In models containing Tone Dev. Pot., resistor R1434 limits the charging current of C1423 thus protecting relay K1001 (main chassis) contacts from damaging currents.



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Figure 1-5. Variable IF amplifier circuit, schematic diagram.

The +18-volt supply is filtered by inductors L508 and L509 and capacitors C521 and C522.

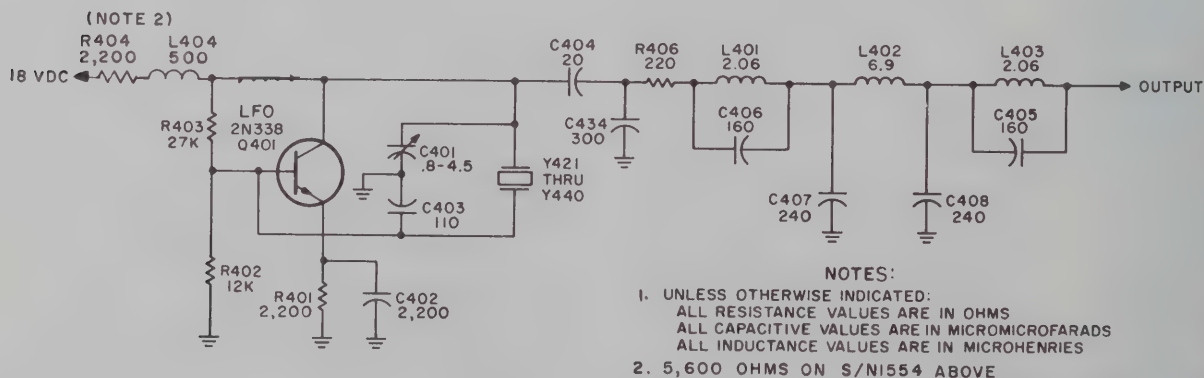
b. Resistors R510 and R512 and inductors L508 and L509 form part of the collector-load impedance for the final age amplifier stage (Q1206 in the fixed IF module). Age voltage is coupled from the junction of resistors R510 and R512 through R511 to the emitter of Q502. Capacitor C520 is the emitter bypass capacitor for Q502. Resistor R510 and capacitor C516 filter the age voltage. The amplified signal is coupled from the collector of Q502 to the output tuned circuit, which consists of capacitors C518, C519, and C523 through C531; inductors L504, L505, and L506; and resistor R513. Capacitors C518, C525, and C529 are trimmer capacitors. Inductors L504, L505, and L506 are tuned by the mechanical drive assembly. Capacitor C531 and inductor L506 form an impedance divider, which insures the proper input signal to mixer Q503. In transmit condition, the output is coupled through coupling capacitor C532 to the second transmitter mixer in the RF amplifier module.

1-20. Low-Frequency Oscillator Q401

(figs. 1-6 and 1-7)

a. The low-frequency oscillator produces injection signals for amplifier/mixer Q501 and receiver mixer Q503. The oscillator uses a type 2N338 transistor in a Pierce oscillator circuit to produce 20 injection signals from 4.475 to 5.425 mc in 0.05-mc steps. Rotary selector switch S401, which is positioned by the mechanical drive assembly, inserts 1 of 20 crystals into the oscillator tank circuit of each 0.05-mc step. In transmit operations, the lfo diode switch connects the output signal to amplifier/mixer Q501; in receive operations, the diode switch connects the output signal to receive mixer Q503.

b. Transistor Q401 is connected in the common-emitter configuration with the feedback supplied from collector to base. Resistors R401, R402, and R403 provide the proper bias and stabilizing conditions for the circuit. Resistors R402 and R403 develop the base bias voltage. Capacitor C402 bypasses the emitter resistor, R401, to prevent excessive degenerative feedback. The +18-volt supply provides voltage to the collector through line filter FL401 (fig 1-7) inductor L405, load resistor R404, and inductor L404. Inductors L404 and L405 and capacitors C410 and C412 form a filter network that, in conjunction with load resistor R404, decouples the oscillator output signal from +18-volt supply. Capacitors C401 and C403 form the tank circuit with the inserted crystal. The crystal and the parallel capacitance offered by capacitors C401 and C403 determine the operating frequency. Capacitor C401 is adjustable to permit fine tuning of the oscillator to compensate for circuit component variations. The combination of C403 and the crystal provides the 180° phase reversal necessary to start and sustain oscillations. The output signal is developed across load resistor R404 and passes through coupling capacitor C404, to the RC filter network consisting of resistor R406 and capacitor C434, and the LC filter consisting of inductor L402 and capacitors C407 and C408, and the two (2) harmonic filters consisting of inductors L401 and L403 and capacitors C406 and C405, then to the mixer/amplifier Q501. The harmonic filter attenuates the harmonic frequencies in the oscillator output. A portion of the oscillator output signal also passes through capacitor C409 and is developed across resistor R405. Diode CR411 rectifies this signal and applies it to the TEST METER through a filter network consisting of



TM 5821-244-35-C-8

Figure 1-6. Low-frequency oscillator circuit, simplified schematic diagram.

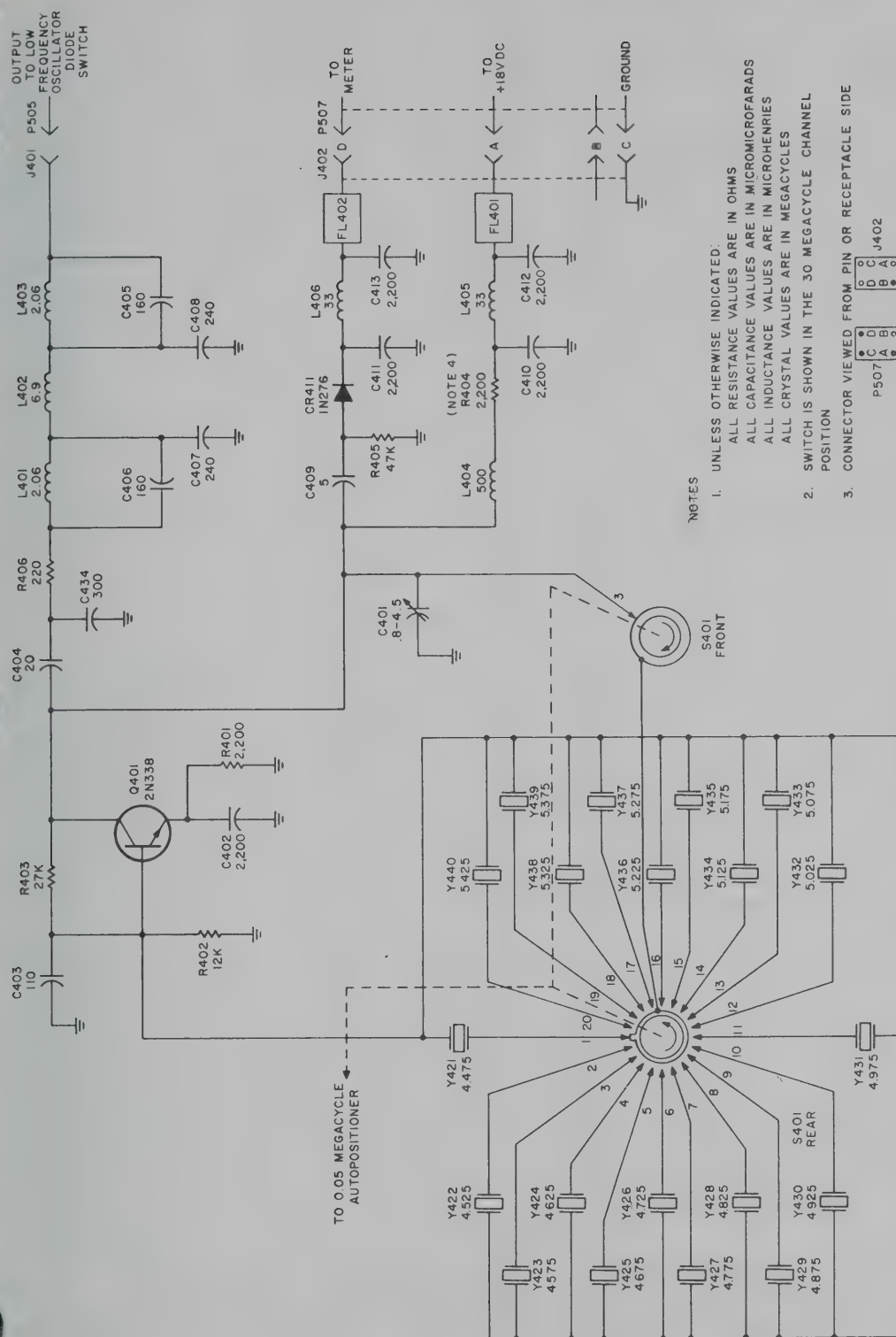


Figure 1-7. Low-frequency oscillator module, schematic diagram.

inductor L406, capacitors C411 and C413, and line filter FL402.

1-21. RF Amplifier Q601, Q602, Q603

(fig. 6-19)

a. Incoming RF signals are coupled from the antenna through normally closed contacts of relay K601 and inductively coupled from coupling link L601 to the first tuned circuit consisting of inductor L602 and capacitors C601A and C604. During transmit operation, relay K601 is energized, disconnecting the antenna from the RF amplifier and connecting the input coupling link, L601, to ground. The signal is then coupled by mutual inductor L616 to the second tuned circuit consisting of inductor L603 and capacitors C601B and C608. Capacitor C609 couples the signal to Q601. Capacitor C607 and inductor L606, an impedance-matching network, provide the proper impedance over the frequency band for coupling the received signal to first amplifier stage Q601. Fixed bias is applied to the base of Q601, from the +18 volts at pin B of the module connector J601, through the voltage divider consisting of resistors R603 and R604. Capacitor C615 is an RF bypass. A ferrite bead (E609) prevents parasitic oscillations. Resistor R601 forms part of the collector-load resistance for the final age amplifier stage (Q1206 in the fixed IF module). The age voltage is coupled through this resistor to the emitter circuit of Q601. The age voltage opposes the fixed dc bias, applied from the +18-volt line through resistor R602. When the input RF signal amplitude is low the age voltage is approximately the same value as the fixed bias level at the junction of R601 and R602 so no current flows through R601. At higher levels of RF signal (with lower age voltage) however, some current does flow through R601, causing the emitter of Q601 to become less positive thereby decreasing the gain of the stage. Inductors L605, L608, L611, and L614 and capacitors C606, C612, C614, C619, C644, and C624 provide RF filtering for the +18-volt supply. Inductors L618, L604, and L607 and capacitors C645, C605, C611, C645, and C613 filter the age line.

b. The output of Q601 is coupled to the third tuned circuit, consisting of capacitors C616 and C601C and inductor L609. Capacitors C617 and C618 form an impedance divider and inductor

L610 and capacitor C628 provide impedance matching to couple the signal to second amplifier stage Q602. Resistors R607 and R608 provide fixed base bias. Age voltage is applied to the emitter circuit of Q602 through resistor R605. Resistor R606 is the emitter resistor from the +18-volt supply. Capacitor C620 is an RF bypass.

c. The output of amplifier Q602 is coupled to the fourth tuned circuit, consisting of capacitors C621 and C601D and inductor L612. Capacitors C622 and C623 form an impedance divider and inductor L613 and capacitor C643 provide impedance matching to couple the RF signal to third amplifier stage Q603. Fixed bias is applied through emitter resistor R609 and through the base voltage divider consisting of R610 and R611. Capacitor C625 is an RF bypass capacitor. The output of amplifier Q603 is coupled, through the final tuned circuit consisting of capacitors C626 and C601E, and inductor L615, and through coupling capacitor C627 to J602 and through C629 (fig. 6-3) to the receiver mixer circuit.

1-22. Diode Switching Circuit

(fig. 6-3)

a. Receive Operation. During receive operation, +27.5 volts is applied to the diode switching circuit from pin A of the module connector. Capacitor C633 is an RF bypass. Current flow through the resistance network comprising R620 through R624 provides forward bias for diode switches CR604 and CR606. With these two diode switches closed, a path is supplied to couple the signal from the high-frequency oscillator, through capacitors C635 and C639, to receiver mixer Q605. Diodes CR605 and CR607 are reversed biased, preventing the signal from shorting to ground. Capacitor C637 is an RF bypass capacitor. The high-frequency oscillator signal is prevented from reaching transmitter mixer Q604 by the shorting effect of diode CR602, which is forward biased because of the voltage drop of resistors R619 and R618, and by the reverse biasing of diode CR603 because of the ground placed at the anode end of the diode through closed diode switch CR602. Current flow through R617 and R616 forward biases CR601 to provide a biasing current to keep Q604 from conducting.

b. Transmit Operation. In transmit operation, the voltage at pin A of the module connector is

-27.5 volts and the biasing action described in *a* above is reversed, providing a low-impedance path to the transmitter mixer and a high-impedance path to the receiver mixer. In this condition, current flow through resistors R617 and R616 reverse-biases diode CR601, preventing dc from reaching the base of transistor Q604. The high-frequency oscillator signal is coupled through inductor L617, forward-biased diode CR603, and coupling capacitor C632 to the base of transmitter mixer Q604. Inductor L617 attenuates the signal to provide the proper input level to mixer Q604 while providing a low resistance dc path for diode biasing. Diode CR602 is reverse biased to prevent grounding the signal. Diodes CR604 and CR606 are reverse biased and diodes CR605 and CR607 are forward biased, preventing the signal from reaching the base of receiver mixer Q605; also, Q605 is cut off by the decrease in current flow through resistor R628 because of reverse biasing of diode CR608.

1-23. Transmitter Mixer Q604

(fig. 6-3)

The second transmitter mixer consists of transistor Q604; capacitors C630, C631, and C644; and resistors R612 through R615. In transmit operation, the high-frequency oscillator signal is coupled from plug P602 through capacitor C635, inductor L617, diode CR603, and capacitor C632, to the base of mixer transistor Q604. Transistor Q604 mixes this signal with the output from the variable IF module (3.975 to 5.925 megacycles) coupled to the emitter of Q604 through coupling capacitor C630, and supplies the resulting signal (30.00 to 69.95 megacycles) to the RF amplifier circuit. The signal is amplified in the RF amplifier circuits (para. 1-21*a*) and then coupled to the power amplifier module through J602. Transistor Q604 is biased by the voltage dividers consisting of resistors R615 and R614 and R612 and R613. Capacitors C644 and C631 provide RF filtering.

1-24. Receiver Mixer Q605

(fig. 6-3)

Input signal from the high-frequency oscillator module is coupled from the input plug P602 through coupling capacitor C635, diodes CR604 and CR606, and coupling capacitor C639, to the

emitter of mixer Q605. RF signal from the RF amplifier circuits is coupled through diode CR608 to the base of mixer Q605. When the radio set is in receive operation, diode CR608 is forward biased (para. 1-22) and resistor R628 provides forward operating bias for Q605. The emitter of Q605 is maintained slightly positive by current flow through resistors R626 and R625. Capacitors C642 and C641 filter out RF. The mixer output, 3.975 to 5.925 megacycles, is coupled from the collector of Q605 through autotransformer T601 to the variable IF module. In transmit operation, CR608 is reverse biased (para. 1-22*b*) and the voltage at the base of Q605 is near zero, cutting off Q605.

1-25. High-Frequency Oscillator Q301

(figs. 1-8 and 6-16)

a. The high-frequency oscillator uses a transistor connected as a common-base oscillator to produce the injection signals for transmitter mixer Q604 and receiver mixer Q605. The oscillator can produce 20 operating frequencies from 26.025 to 64.025 mc in 2-mc steps. Rotary selector switch S301, which is positioned by the mechanical drive assembly, inserts the proper crystal and inductor into the oscillator tank circuit to control the output frequency.

b. The oscillator operates at the series resonant frequency of the inserted crystal and associated inductor. Resistors R301, R302, R303, R304, and R305 provide proper bias and stabilizing conditions for the circuit. Resistor R301 is also an emitter swamping resistor. Resistor R302 is the emitter bias resistor and resistors R303 and R304 form a voltage divider that provides base bias with resistor R305, the collector-load resistor. Capacitors C301 and C303 are RF bypass capacitors. Capacitor C301 effectively connects the lower end of resistor R301 to RF ground potential to allow the emitter input signal to be developed across resistor R301 and it also aids in decoupling the ac signal from the +18-volt supply. Capacitor C303 connects the base of transistor Q301 to ac ground potential. Capacitors C304 and C305, which are connected in parallel with the selected inductor, L305 through L324, form a high-Q tank circuit between the collector and ground. Capacitors C304 and C305 form a voltage divider. The

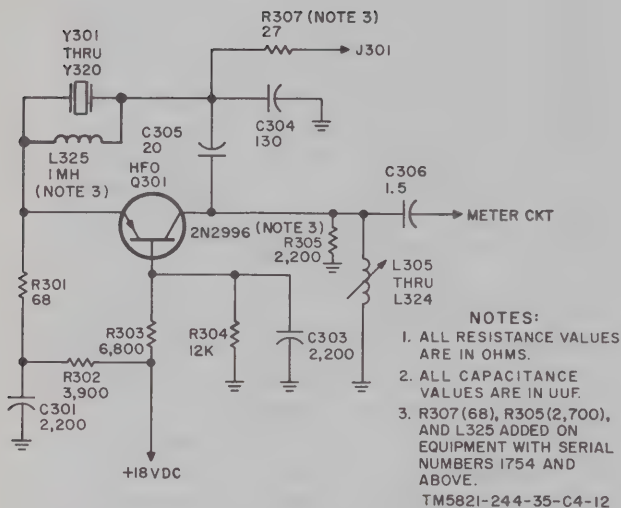


Figure 1-8. High frequency oscillator circuit, simplified schematic diagrams.

feedback voltage developed across C304 is applied through the selected crystal, Y301 through Y320, to the emitter. Transistor Q301 is connected as a common-base amplifier; therefore no phase shift is required between the signal on the collector and the signal on the emitter. The feedback signal is not phase shifted. At resonance, the crystal impedance is low; at frequencies other than resonance, the crystal impedance is high. Therefore, the feedback from the collector to the emitter starts and sustains oscillations only at the resonant frequency of the selected crystal. Switch S301

inserts a different inductor into the collector tank circuit as each new crystal is selected so that the resonant frequency of the collector tank circuit is of the same order as the natural frequency of the crystal. Inductors L301 and L302 and capacitor C301 form an RF filter network that decouples the RF signal from the +18-volt supply. The output signal from the oscillator is taken at the junction of capacitors C304 and C305 and applied to the hfo diode switch (in the RF amplifier) through decoupling resistor R307. A portion of the output signal from the collector is rectified, filtered, and applied to the TEST METER to provide an indication of oscillator operation. Capacitor C306 couples the signal to the diode rectifier CR 301. Resistor R306, inductors L303 and L304 and capacitors C307 and C308 form a filter network that provides a smooth dc signal to the TEST METER.

1-26. RF Power Amplifier Court (fig. 1-9)

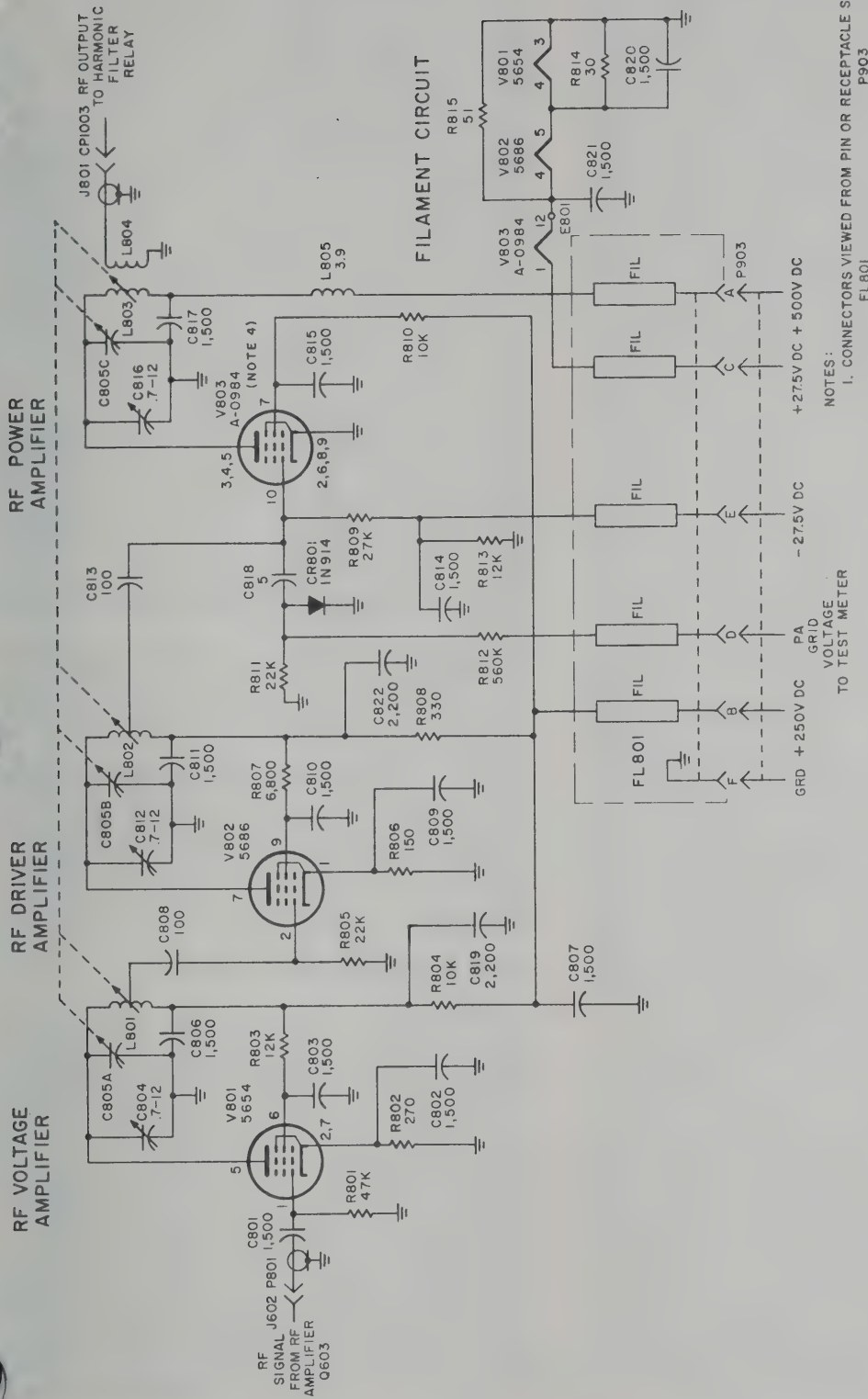
a. *Introduction.* The RF power amplifier circuit receives the low-level signal from RF amplifier Q603 and increases the power level of the signal to achieve adequate power radiation characteristics. The circuit contains three ganged-tuned vacuum tube amplifier stages connected in cascade. The output of the circuit is applied to either the 30- to 45.95-mc low-pass filter or the 46- to 69.95-mc low-pass filter. The mechanical drive assembly tunes each stage. The tuning range of the circuit is from 30 to 69.95 mc.

b. *RF Voltage Amplifier V801.* RF voltage amplifier V801 amplifies the 30- to 69.95-mc input signal from RF amplifier Q603. The input signal is applied to the grid circuit through coaxial connector P801 and coupling capacitor C801. Tube V801 is connected as a conventional sharp-cutoff RF pentode amplifier. Resistor R801 is a grid-leak resistor, and provides a dc return path to ground for the grid. Resistor R802 provides cathode bias. RF bypass capacitor C802 places the cathode at RF ground potential. The high-voltage power supply provides plate and screen voltages (+250 volts dc) through pin B of connector line filter FL801 and voltage-dropping resistor R804 to the screen and through plate tank inductor L801 to

the plate. Capacitor C803 is the screen bypass capacitor. Resistor R803 is a screen-dropping resistor. Resistor R804 drops the +250-volt supply to a safe operating plate voltage. Capacitor C819 is an RF bypass capacitor. The plate tank circuit consists of inductor L801, tuning capacitor C805A, and trimmer capacitor C804. Capacitor C806 is an RF bypass capacitor that connects the lower end of L801 to RF ground potential. Inductor L801 and capacitor C805A, which are positioned by the dif-

ferential tuning shaft in the mechanical drive assembly, tune the tank circuit. The differential and associated gear train automatically tunes the variable capacitor and the slug-tuned coils to resonance as each of the 800 channels is selected, thereby providing a fairly constant inductance-capacitance (LC) ratio across the band. A tape near the center of inductor L801 feeds the amplified signal to the grid of RF driver amplifier V802 through coupling capacitor C808.





- NOTES:
1. CONNECTORS VIEWED FROM PIN OR RECEPTACLE SIDE
 2. UNLESS OTHERWISE INDICATED:
ALL RESISTANCE VALUES ARE IN OHMS
ALL CAPACITANCE VALUES ARE IN MICROMICRO-FARADS
ALL INDUCTANCE VALUES ARE IN MICROHENRIES
 3. E801 IS A FERRITE BEAD
 4. TUBE TYPE 7984 CANNOT BE SUBSTITUTED

Figure 1-9. RF power amplifier circuits, schematic diagram.

c. Rf Driver Amplifier V802. This stage raises the level of RF voltage amplifier output signal sufficiently to drive the final power amplifier, V803. Tube V802 is a conventional beam-power amplifier tube biased for class AB operation. The incoming signal is coupled to the grid circuit through capacitor C808. This capacitor blocks the dc plate voltage from the preceding stage. Resistor R805 is a grid leak resistor. Resistor R806 is the cathode bias resistor. Bypass capacitor C809 places the cathode at RF ground potential. Plus 250 volts dc is supplied from the high-voltage power supply circuit through pin B of connector line filter FL801, dropping resistor R808 and screen-dropping resistor R807 to the screen grid and through inductor L802 to the plate. Capacitors C807, C810, C811, and C822 are RF bypass capacitors. Trimmer capacitor C812, tuning capacitor C805B, and inductor L802 tune the plate tank circuit across the 30- to 69.95-mc range. Capacitor C805B and inductor L802, which are ganged with the capacitors and inductors in the preceding RF voltage amplifier stage and the following RF power amplifier stage, are driven by the differential in the mechanical drive assembly to provide tuning adjustments over the entire range of the radio set. The amplified output signal is developed across the plate tank circuit and is capacitively coupled from a tap on inductor L802 to the grid of RF power amplifier V803.

d. RF Power Amplifier V803. This stage raises the level of the RF signal and link-couples it to the harmonic filter circuits. Tube V803 is a compact-beam pentode tube operating near class C. The stage uses both fixed and grid-leak bias. The incoming signal is applied to the grid of tube V803 through coupling capacitor C813. A fixed -27.5-volt dc bias is supplied through pin E of connector line filter FL801. Resistor R813 loads the power supply to allow regulation of the fixed bias. Capacitor C814 is an RF bypass capacitor. The incoming signal draws grid current which develops additional bias across resistor R809. Screen voltage (+250 volts dc) is supplied from the high-voltage power supply circuit through pin B of connector line filter FL801 and dropping resistor R810. Capacitor C815 is an RF bypass capacitor, which holds the screen grid at RF ground potential. Plate supply voltage, +500 volts dc, is supplied from the high-voltage power supply circuit

through pin A of connector line filter FL801 and inductors L803 and L805. The plate tank circuit is composed of trimmer capacitor C816, tuning capacitor C805C, and inductor L803. Capacitor C805C and inductor L803, which are ganged with the capacitors and inductors in the plate tank circuits of amplifiers V801 and V802, tune the stage to provide resonance at any of the 800 selectable frequencies between 30 and 69.95 mc. Capacitor C817 is an RF bypass capacitor, which connects L801 to RF ground. Inductor L805 effectively prevents any RF signal at the plate from reaching the +500-volt power supply. The RF output signal is link-coupled through inductor L804 and coaxial connector J801 to the harmonic filter circuit. A portion of the RF signal at the grid of V803 is sampled through capacitor C818. Diode CR801 rectifies the RF signal. Resistor R811 provides a dc return for the rectifier. The rectified dc at this point provides a direct current, through current-limiting resistor R812, to the TEST SWITCH on the front panel of the receiver-transmitter unit through pin D of connector line filter FL801.

e. Filament Circuit. The filament supply voltage for tubes V801, V802, and V803 is obtained from the +27.5 volts applied to pin C of connector line filter FL801. Resistors R814 and R815, in conjunction with the three filaments, form a series parallel circuit which provides proper operating voltages and currents for the three tube filaments. Capacitors C820 and C821 are RF bypass capacitors. A ferrite bead, E801, provides RF decoupling.

1-27. Harmonic Filter Circuits

(fig. 6-13)

The harmonic filter circuit, comprising inductors L1605 through L1608 and capacitors C1611 through C1619, filters out harmonics of all transmitted signals in the frequency range of 30 to 45.95 megacycles. The harmonic filter circuit comprising inductors L1601 through L1604 and capacitors C1601 through C1609 attenuates harmonics of all transmitted signals in the frequency range of 46 to 69.95 megacycles. Both of the filters consist of four parallel-resonant traps in series with the RF signals and five shunt capacitors. The overall function of the filters is to attenuate all harmonics of the passband fre-

quencies (30.00 to 45.95 or 46 to 69.95 megacycles) while offering minimum loss to the passband frequencies. Capacitors C1627 and C1628 and inductor L1610 form a single pi-section low-pass filter to attenuate ultrahigh frequencies (uhf). Relays K1601 and K1602 are deenergized for operating frequencies from 46 to 69.95 megacycles and energized for operating frequencies from 30 to 45.95 megacycles. The switching is accomplished by the connection of pin D of the module connector to ground by the frequency selector switches at the system control box.

1-28. Sidetone Gate Rectifier

(fig. 6-13)

The sidetone gate rectifier circuit rectifies and filters a portion of the RF to provide a dc level to forward bias diode switch CR1403 in the transmit audio module. The circuit consists of diodes CR1603 and CR1604; capacitors C1610, C1620, C1621, C1622; and resistor R1607. A portion of the RF is coupled through coupling capacitor C1610 to diodes CR1603 and CR1604, where it is rectified. Inductor L1609 and capacitors C1620 and C1621 provide RF filtering. Resistor R1607 is a current-limiting resistor and capacitors C1622 and C1629 provide additional RF filtering.

1-29. Reflectometer

(fig. 6-13)

The reflectometer and associated circuit detect forward and reflected energy on the radio set transmission line. This energy is coupled to the test meter on the receiver-transmitter unit for a visual display of the transmission efficiency of the radio set and antenna system. The reflectometer consists of a directional coupler with its components (three copper strips) arranged to measure incident and reflected waves. The two outer copper strips are terminated by resistors R1601 and R1602. The center strip connects the output from the harmonic filter to the antenna. RF energy is electromagnetically coupled from the center strip to the two outer strips. For one outer strip, the inductive coupling is in phase with the capacitive coupling, and therefore adds to yield the incident wave. When the output is terminated by the proper load, no reflected waves occur since the inductive and capacitive coupling is out of phase in the other outer strip. The strip that

is terminated by resistor R1602 is terminated in the proper direction to couple incident waves, which cause current flow through diode detector CR1601 and current-limiting resistor R1604. Capacitor C1626 and resistor R1603 compensate for variations in the coupling impedance of the reflectometer at different frequencies to provide a constant value of meter current throughout the frequency spectrum for any given value of transmitted RF energy. Capacitors C1624 and C1631 provides RF filtering. Reflected RF energy causes current flow through diode detector CR1602 and current-limiting resistor R1605. Capacitors C1623 and C1630 and resistor R1606 compensate for variations in the coupling impedance of the reflectometer at different frequencies to provide a constant value of meter current throughout the frequency spectrum for any given value of reflected RF energy. Capacitor C1625 provides filtering.

1-30. Bandpass Filter FL1201

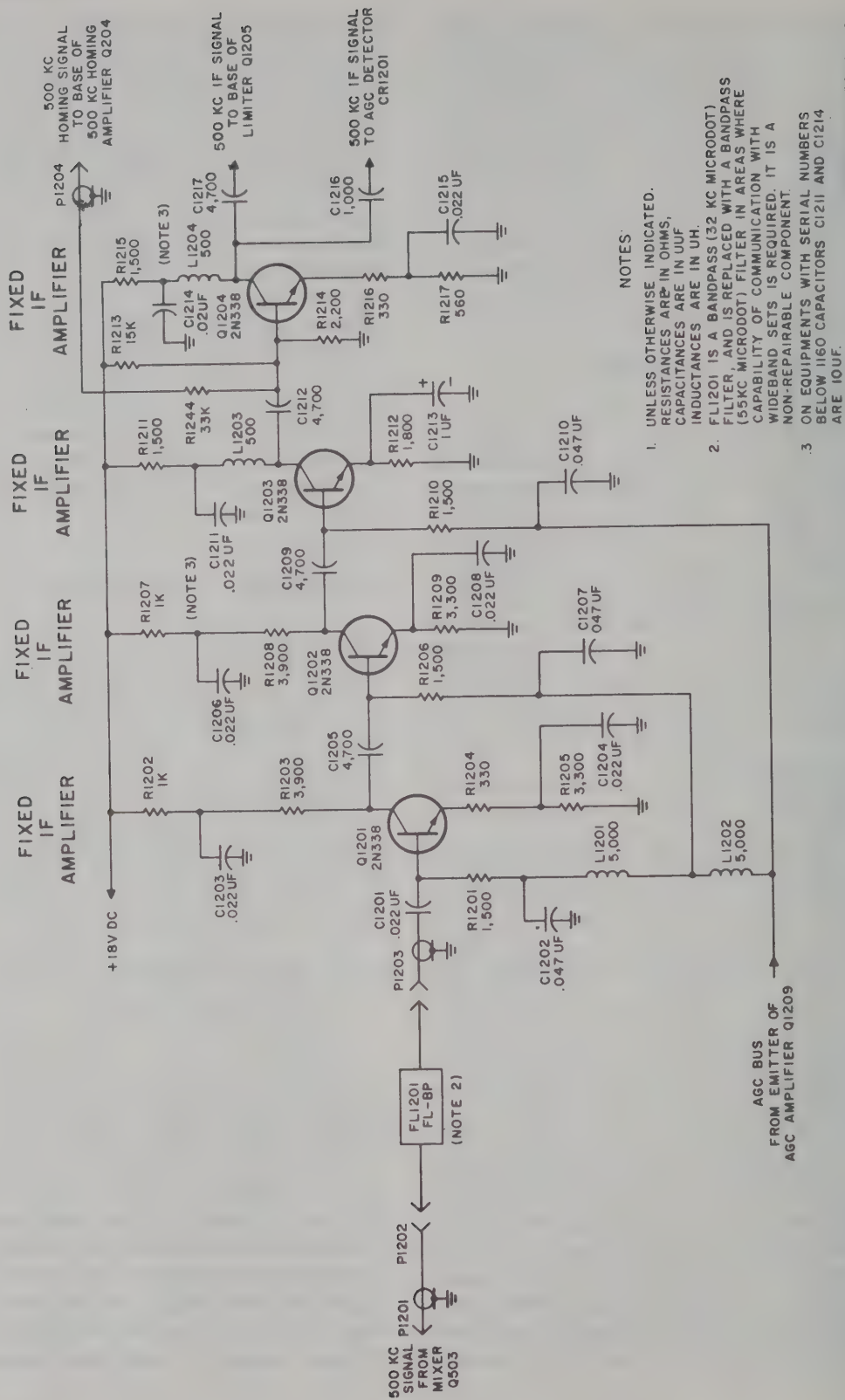
(fig. 1-10)

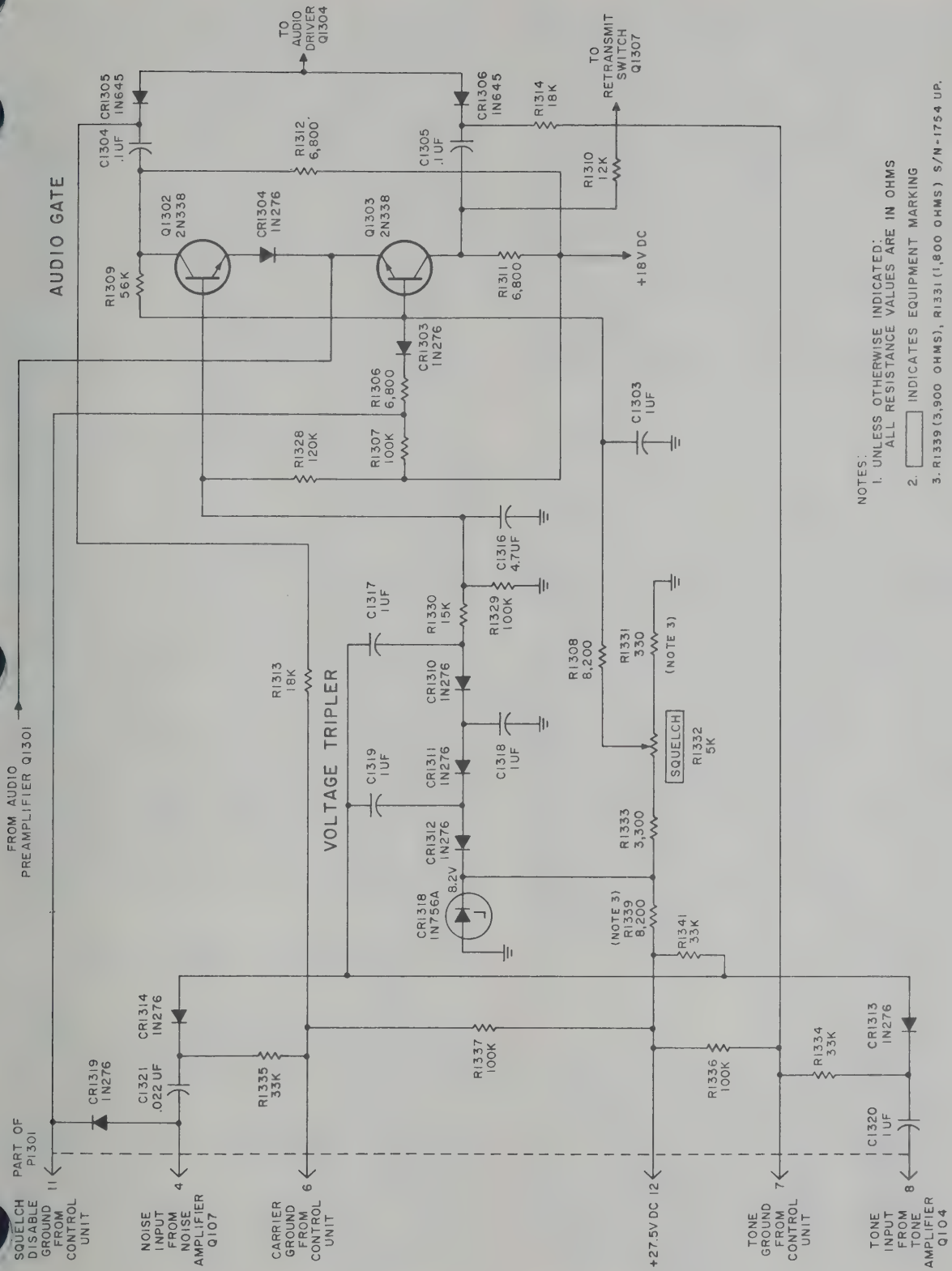
Bandpass filter FL1201 provides a minimum bandwidth of 30 kc between the -6-decibel (db) points and a maximum bandwidth of 100 kc between the 80-db points on the selectivity curve. This stage is a sealed ceramic filter that contains several tuned circuits. The 500-kc fixed IF signal from receiver mixer Q503 is applied to the filter through coaxial connectors P1201 and P1202. The filtered output is applied to the base of fixed IF amplifier Q1201 through coaxial connector P1203 and coupling capacitor C1201.

1-31. Fixed IF Amplifiers Q1201, Q1202, Q1203, and Q1204

(fig. 1-10)

a. Introduction. Fixed IF amplifiers Q1201, Q1202, Q1203, and Q1204 amplify the output of bandpass filter FL1201 and further attenuate unwanted frequencies that appear in the filter output. The stages are high-gain voltage amplifiers connected in cascade. Each stage consists of a NPN transistor connected in a common-emitter configuration. The age circuit regulates the gain of the first three stages. When several amplifier stages using the same power supply are tuned to the same frequency (as in these stages), oscilla-





NOTES:

1. UNLESS OTHERWISE INDICATED:
ALL RESISTANCE VALUES ARE IN OHMS
2. INDICATES EQUIPMENT MARKING
3. R1339 (3,900 OHMS), R1331 (1,800 OHMS) S/

TM5821-244-35-C4-19

Figure 1-13. Audio gate and voltage tripler circuits, schematic diagram.

R1313, and R1314. When carrier or tone squelch ground is applied, resistors R1336 and R1337 limit current from ground to the +27.5-volt supply.

b. Tone Squelch Mode. In the tone squelch mode, pin 7 of the module connector is grounded, forward biasing diodes CR1313 and CR1306. In this mode, the static and dynamic conditions of transistors Q1302 and Q1303 are controlled by the rectified 150-cps tone from tone amplifier Q104 instead of by the noise input. When the 150-cps tone is present, audio signal from preamplifier Q1301, is coupled through gating transistor Q1303, coupling capacitor C1305, and forward-biased diode CR1306, to the audio driver input circuit. In this mode, the retransmit switch is deenergized by the presence of a tone (Q1303 conducting), and energized by the absence of a tone (Q1303 off).

c. Squelch Disabled Mode. In the squelch disabled mode, pins 11 and 6 of the module connector are at ground potential. The ground from pin 11 is applied at the junction of resistors R1307 and R1306. This causes a fixed bias to be developed through the voltage divider consisting of resistors R1306, R1308, R1332, and R1333. This bias, applied to the base of transistor Q1303, is less than the bias applied to the base of transistor Q1302 by the voltage divider consisting of resistors R1329 and R1328, so Q1302 conducts and Q1303 is turned off. Diode CR1305 is forward biased because of the ground applied to its cathode from pin 6 of the module connector. The ground applied at pin 11 forward biases diode CR1319, grounding the noise input (pin 4 of module connector) so that transistor Q1302 will remain on regardless of noise input. All signals from audio preamplifier Q1301 are coupled through transistor Q1302 to the audio driver input circuit. Resistors R1313 and R1314 provide a dc path for biasing current for diodes CR1305 and CR1306.

1-36. Voltage Tripler

(fig. 1-13)

a. In carrier squelch mode, the voltage tripler rectifies and multiplies the level of noise input to supply a negative base-biasing voltage to audio gate transistor Q1302. In tone squelch mode, the voltage tripler rectifies and multiplies the tone input to supply a negative base-biasing voltage to audio gate transistor Q1302. In carrier squelch mode, noise is coupled to the voltage tripler from

pin 4 of the module connector through coupling capacitor C1321 and diode switch CR1314, which is forward biased by current flow from pin 6 of the module connector through resistor R1335, diode CR1314, and resistor R1341. In tone squelch mode, the 150-cps tone is coupled to the voltage tripler from pin 8 of the module connector through coupling capacitor C1320 and diode switch CR1313, which is forward biased by current flow from pin 7 of the module connector through resistor R1334, diode CR1313, and resistor R1341.

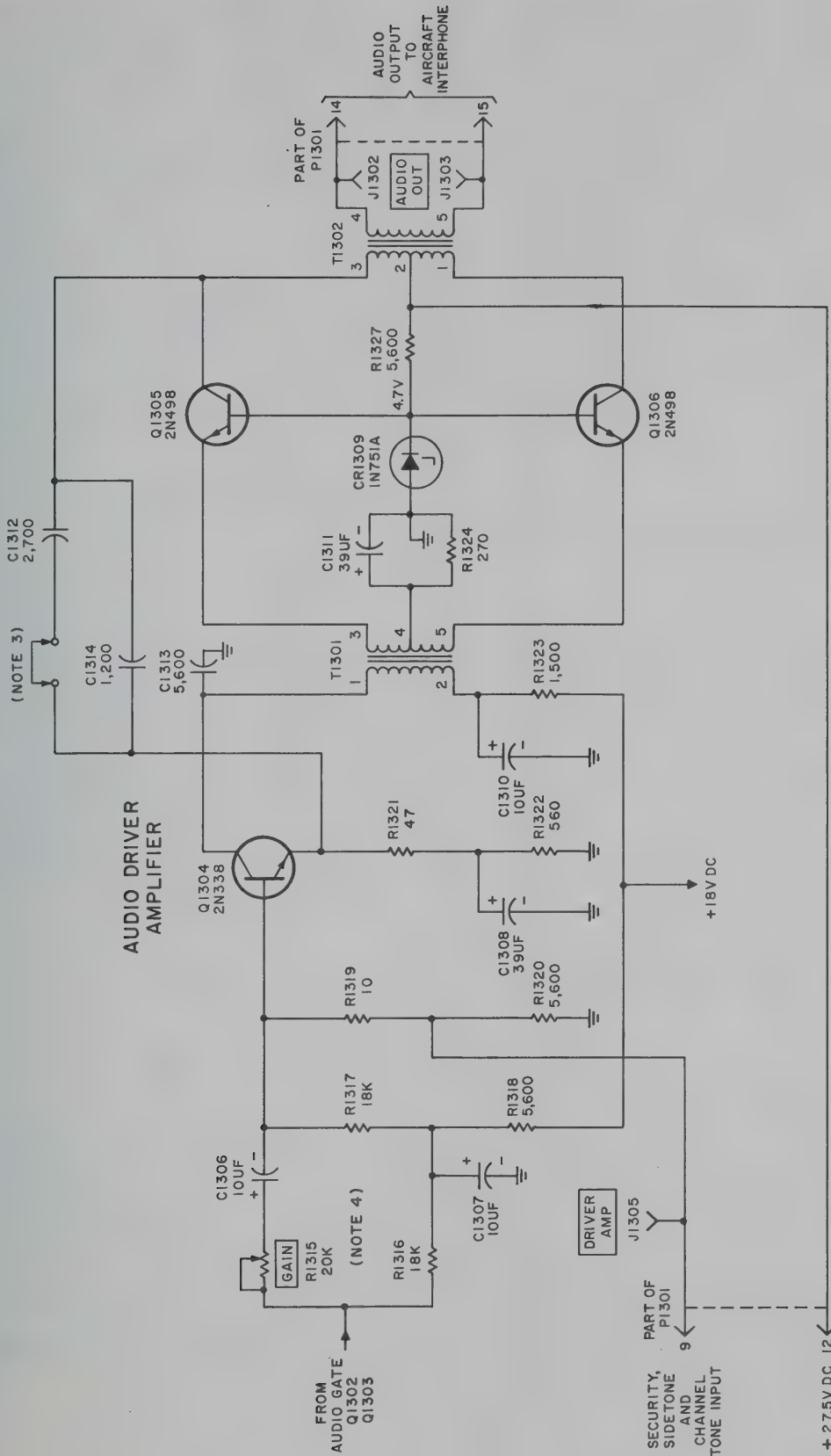
b. During the first positive half-cycle of input signal (noise or tone), capacitor C1319 charges to the signal amplitude through Zener diode CR1318 and diode CR1312. During the negative half-cycle that follows, capacitor C1319 discharges through diode CR1311, charging capacitor C1318 to the value of input signal plus the value of charge across capacitor C1319. Capacitor C1318, therefore, charges to twice the signal voltage. During the second positive half-cycle (the third half-cycle), capacitor C1318 discharges through diode CR1310 and charges capacitor C1317 to the value of the input signal plus the value of charge across capacitor C1318. Capacitor C1317, therefore, charges to three times the input signal level. Zener diode CR1318 and resistor R1339 establish a reverse bias of +8.2 volts for diodes CR1310, CR1311, and CR1312 to assure that the voltage tripler does not operate during the presence of a carrier (minimum noise level). A voltage divider formed by resistors R1330 and R1329 decrease the output negative voltage level so that audio gate transistor Q1302 will not be damaged by excessive reverse bias. Capacitor C1316 filters the voltage tripler output.

1-37. Audio Driver Amplifier Q1304

(fig. 1-14)

The audio driver amplifier amplifies the audio signal, the sidetone, the channel tone, and the security input to a level that is sufficient to drive the audio power amplifier. Input audio from the audio gate is coupled through potentiometer R1315 and coupling capacitor C1306 to the base of audio driver amplifier Q1304. Potentiometer R1315 is used to adjust the audio level. The security, sidetone, and channel tone inputs are coupled to the base of Q1304 through resistor

AUDIO POWER AMPLIFIER



NOTES:

1. UNLESS OTHERWISE INDICATED:
ALL RESISTANCE VALUES ARE IN OHMS
ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS.
2. GAIN INDICATES EQUIPMENT MARKING.
3. JUMPER CONNECTED TO ENABLE AUDIO DEEMPHASIS.

4. GAIN ADJUST CIRCUIT FOR MODULES WITH SERIAL NUMBERS 3471 AND ABOVE:

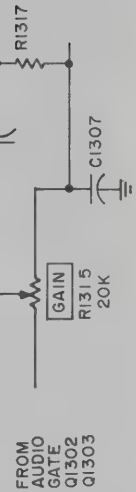


Figure 1-14. Audio driver and power amplifier circuits, schematic diagram.

R1319, part of the base-biasing voltage divider comprising resistors R1317 through R1320. Filter capacitor C1307 isolates audio from the +18-volt bias line. Resistors R1321 and R1322 are emitter swamping resistors. Capacitor C1308 is the emitter bypass capacitor for Q1304. Resistor R1323 is a series dc dropping resistor and the primary of transformer T1301 is the collector ac load for Q1304. Capacitor C1310 isolates audio from the +18-volt bias line. Capacitors C1313, C1312, and C1314 determine the response curve for the stage. Capacitors C1312 and C1314 feed back a voltage that reduces the gain at high audio-frequencies, thereby enabling audio deemphasis. The audio signal, along with any tones that may be present, is amplified and transformer-coupled through transformer T1301 to the audio power amplifier stage.

1-38. Audio Power Amplifiers Q1305 and Q1306

(fig. 1-14)

The audio power amplifier is a push-pull power amplifier circuit which provides 50 milliwatts of audio output. The audio signal is applied directly to the emitters of transistors Q1305 and Q1306. Resistor R1327 and Zener diode CR1309 form a voltage divider, which provides +4.7 volts regulated base bias for Q1305 and Q1306. Degenerative feedback is provided through capacitors C1312 and C1314 for audio deemphasis. Resistor R1324 and capacitor C1311 provide bypassed emitter bias for both transistors. Audio is coupled out through output transformer T1302.

1-39. Retransmit Switch Q1307, K1301

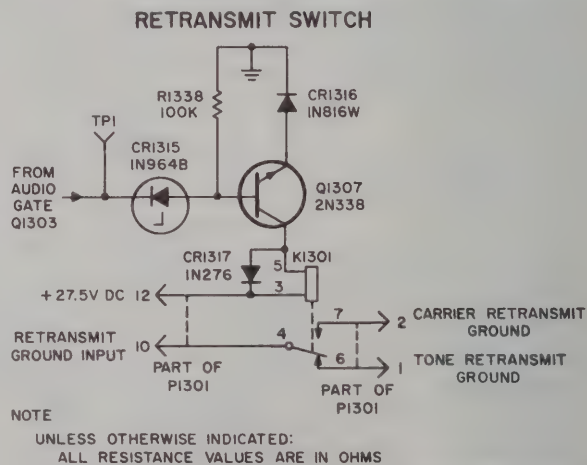
(fig. 1-15)

The retransmit switch is part of an interlock circuit that is used, when two radio sets are connected for retransmit operation, to control the modes (transmit or receive) of the two radio sets. The following discussion is limited to operation of the switch. See paragraphs 1-92 and 1-93 for a discussion of the overall retransmit circuit.

a. Carrier Retransmit Mode. When the radio sets are operating in carrier squelch retransmit mode, the retransmit switch completes the retransmit ground circuit due to the activation of relay K1301 during the presence of a carrier in the radio

set. The relay is energized as follows: When a carrier appears in the radio set, the noise input (pin 4 of the module connector) decreases to a level that is insufficient to activate the voltage tripler. When the tripler output is reduced to zero, fixed bias on the base of audio gate transistor Q1303 turns Q1302 on. Conduction of Q1302 results in a lower positive potential on the collector of Q1302, and, likewise, on the base of transistor Q1303. Transistor Q1303, therefore, turns off, increasing the positive potential at the cathode end of Zener diode CR1315 in the retransmit switch circuit. Zener diode CR1315 conducts through resistor R1338, placing a positive voltage on the base of switching transistor Q1307, turning Q1307 on. Since relay K1301 is in series with Q1307, conduction of Q1307 energizes K1301. Diode CR1316 provides a high emitter resistance during very low current conditions (before Zener breakdown) to insure that transistor Q1307 remains turned off until Zener breakdown. Diode CR1317 provides a path for collapse of the magnetic field around the windings of relay K1301 so that the field does not oppose current flow through the relay winding.

b. Tone Retransmit Mode. When the radio sets are operating in tone retransmit mode, the retransmit switch completes the retransmit ground circuit because of the deactivation of relay K1301 during the presence of a 150-cps tone in the radio set. The relay is deenergized as follows: When a tone-modulated carrier appears in the radio set, the tone signal is rectified and tripled in the volt-



TM5821-244-35-21

Figure 1-15. Retransmit switch circuit, schematic diagram.

age tripler circuit. The negative output from the tripler turns transistor Q1302 off, allowing transistor Q1303 to conduct. Conduction of Q1303 lowers the voltage at the cathode end of Zener diode CR1313 to a level below the breakdown potential of the diode. Transistor Q1307 is then turned off, causing relay K1301 to deenergize.

1-40. Automatic Gain Control Circuit

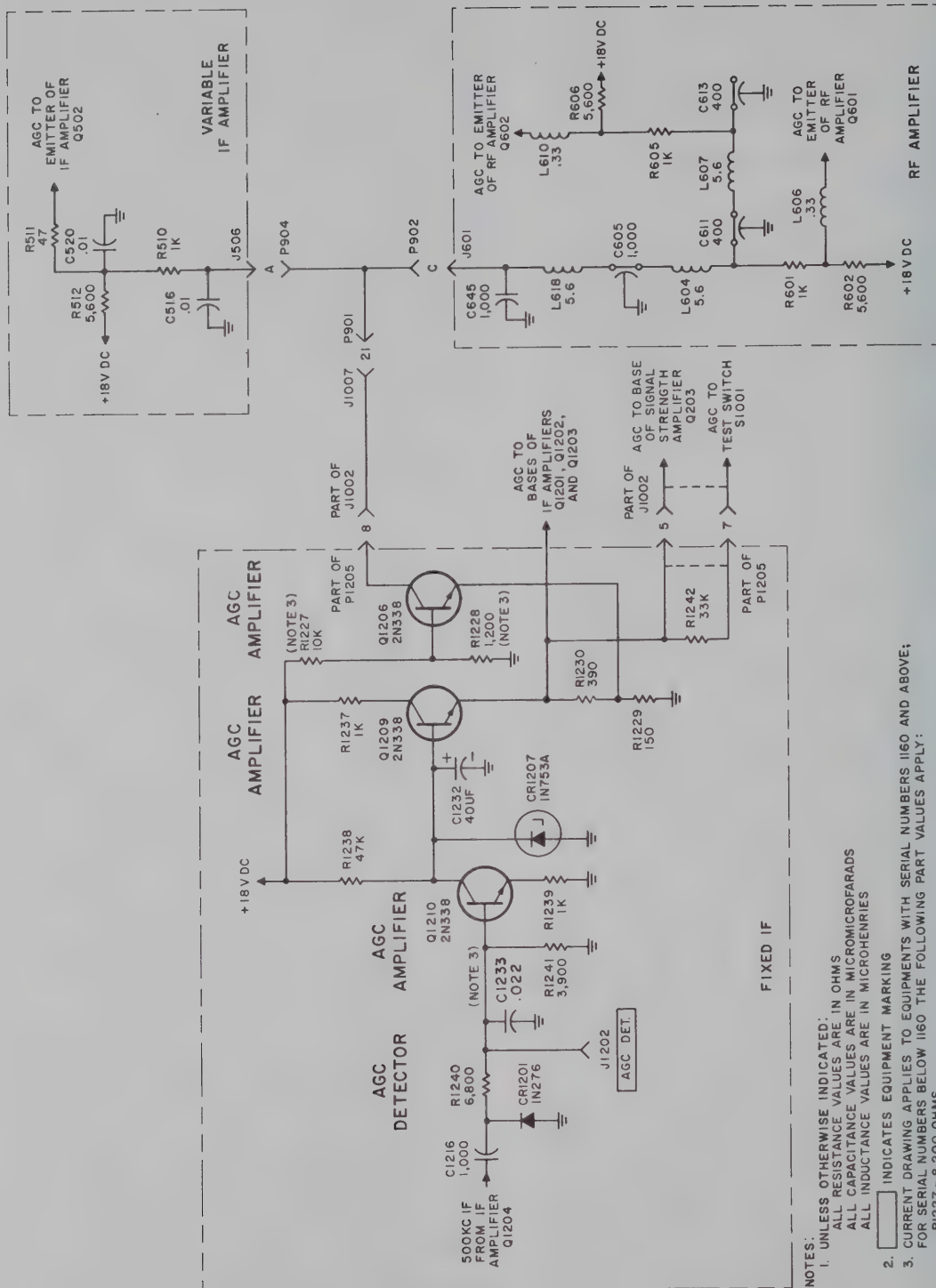
(fig. 1-16)

a. Introduction. The automatic gain control circuit varies the gain of fixed IF amplifiers Q1201, Q1202, and Q1203, variable IF amplifier Q502, and RF amplifiers Q601 and Q602 to compensate for changes in the level of the incoming RF signal. The circuit consists of a diode detector, CR1201, and three direct-coupled amplifier stages, Q1210, Q1209, and Q1206. The diode detector rectifies the RF signal and applies it to age amplifier Q1210. When no signal is present, transistor Q1210 is biased near cutoff and its output is at approximately +6 volts. (Diode CR1207 conducts when the collector rises to approximately +6 volts and clamps the collector of transistor Q1210 and subsequently, the base of transistor Q1209 at approximately +6 volts.) The +6-volt potential on the base causes transistor Q1209 to conduct heavily. The relatively high positive voltage developed across the emitter-load resistors of transistor Q1209 is applied to the bases of fixed IF amplifiers Q1201, Q1202, and Q1203. This positive voltage increases the base-emitter forward bias and subsequently increases the gain of the stages. A portion of the positive voltage developed across the load resistor of transistor Q1209 is applied to the emitter of transistor Q1206. This positive voltage is sufficient to cut off transistor Q1206. The collector circuit of transistor Q1206 is connected to the emitter circuits of variable IF amplifier Q502 and RF amplifiers Q601 and Q602. When transistor Q1206 is cut off, the gain of amplifiers Q502, Q601, and Q602 is high. When a signal is applied to the detector, the positive output of the detector forward biases the base-emitter junction of transistor Q1210, emitter-collector current begins to flow, and collector voltage decreases. The decrease in collector voltage subsequently reduces the positive bias on the base of transistor Q1209. When the collector voltage decreases below the +6-volt level, the Zener diode stops

conducting and the emitter-collector current of transistor Q1209 decreases. This decrease in emitter-collector current reduces the voltage developed across the load resistors in the emitter circuit and reduces the forward bias on the bases of fixed IF amplifiers Q1201, Q1202, and Q1203. The decrease in voltage developed across the load resistor of Q1209 reduces the voltage potential on the emitter of transistor Q1206 and causes emitter-collector current to flow. The increase in current flow through the load resistors of Q1206 decreases the base-emitter bias of variable IF amplifier Q502 and RF amplifiers Q601 and Q602.

b. Age Detector CR1201. The 500-kc signal from fixed IF amplifier Q1204 is applied to the age detector through coupling capacitor C1216. The detector circuit consists of diode CR1201, resistors R1240 and R1241, and capacitor C1233. Diode CR1201 is a rectifying device, resistors R1240 and R1241 are load resistors, and capacitor C1233 is a filter. Diode CR1201 rectifies the ac input signal. During the half-cycle in which the diode does not conduct, current flows through resistors R1240 and R1241 and at the same time, capacitor C1233 charges to the voltage drop across resistor R1241. During the half-cycle that the diode conducts, the signal voltage bypasses resistors R1240 and R1241 through the diode, and capacitor C1233 discharges through resistor R1241. The time constant of resistor R1241 and capacitor C1233 prevents capacitor C1233 from discharging completely before the next half-cycle. During the next half-cycle, capacitor C1233 again charges to the voltage drop across resistor R1241. The charging and discharging of capacitor C1233 filters the age detector output that is a slowly varying dc voltage that increases and decreases with the amplitude changes in the carrier signal. This voltage biases the base-emitter junction of age amplifier Q1210.

c. Age Amplifier Q1210. Resistor R1241, in addition to serving as the detector load resistor, also serves as the base return resistor for transistor Q1210. This transistor is connected as a conventional NPN common-emitter amplifier. Base-emitter bias for the amplifier is developed across resistor R1241. The bias depends upon the strength of the rectified IF signal. When a signal is not present, the base-emitter junction is biased so that transistor Q1210 is near cutoff. When a sig-



TM5821-44-35-C4-22

Figure 1-16. Agc circuits, schematic diagram.

is applied across the squelch adjust potentiometer (on the receiver-transmitter unit front panel), and a portion is coupled from the wiper arm of the squelch adjust potentiometer through pin 13 of the module connector to the noise amplifier circuit.

1-43. Tone Generator-Selective Amplifier Q102, Q103

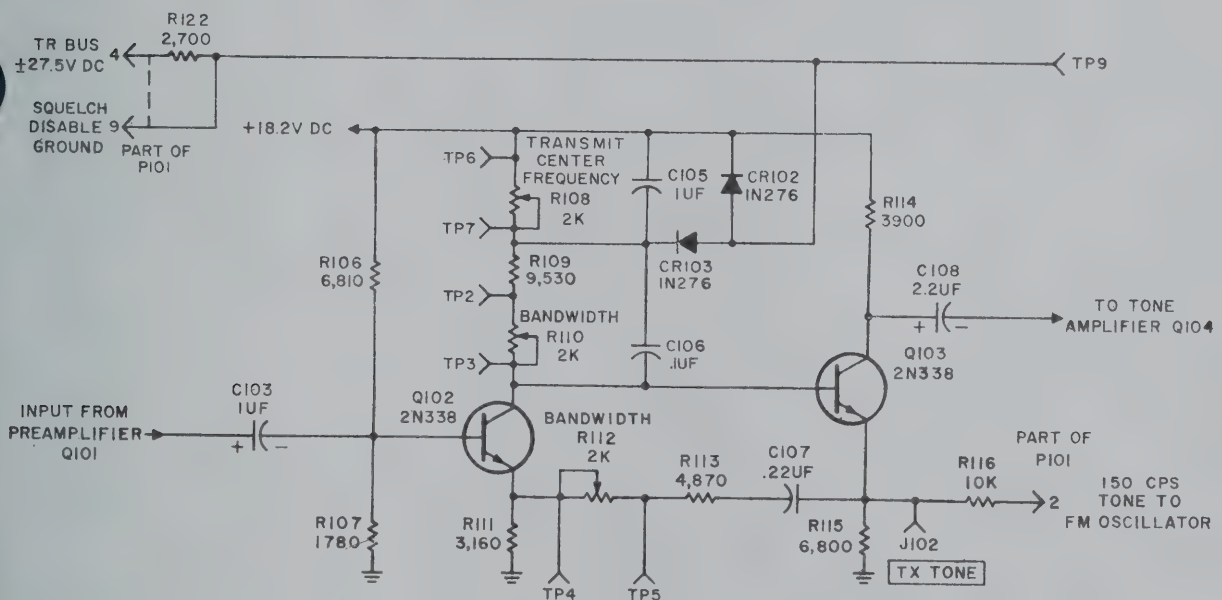
(fig. 1-19)

The tone generator-selective amplifier circuit is a 150-cps generator in transmit mode and a 150-cps selective amplifier in receive mode. The circuit function is controlled by tr bus voltage, which selects the proper circuit impedance for the desired function. The circuit consists of transistors Q102 and Q103 and associated components.

a. Receive Condition. In receive condition, the tr bus voltage, applied at the junction of diodes CR102 and CR103, is positive; therefore, the diodes are forward-biased. With diodes CR102 and CR103 forward-biased, resistor R108 and capacitor C105 are shorted. In this condition, the

collector impedance for transistor Q102 is formed by resistors R109 and R110 and capacitor C106. The resistance-capacitance (rc) time constant of the collector load is such that, at 150-cps, the resistance and the capacitive reactance are equal, providing 45° phase shift (voltage will lag current at the collector of Q102 by 45°). Transistor Q103 has a voltage gain very near unity. The emitter feedback circuit comprising resistors R112 and R113 and capacitor C107 also has a time constant that results in 45° phase shift at 150 cps, but is such that the phase shift introduced by the emitter-feedback circuit cancels the phase shift introduced by the collector impedance. The resulting feedback from emitter of Q103 to the emitter of Q102 will be regenerative and the circuit will have maximum gain at the desired frequency. The collector impedance is not high enough, however, to provide sufficient gain to cause the circuit to oscillate. The 150-cps tone is coupled into the circuit (along with all noise and audio signals present) through coupling capacitor C103 and is

TONE GENERATOR-SELECTIVE AMPLIFIER



NOTES:

1. UNLESS OTHERWISE INDICATED;
ALL RESISTANCE VALUES ARE IN OHMS
ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
2. INDICATES EQUIPMENT MARKING

TM5821-244-35-C4-25

Figure 1-19. Tone generator-selective amplifier, schematic diagram.

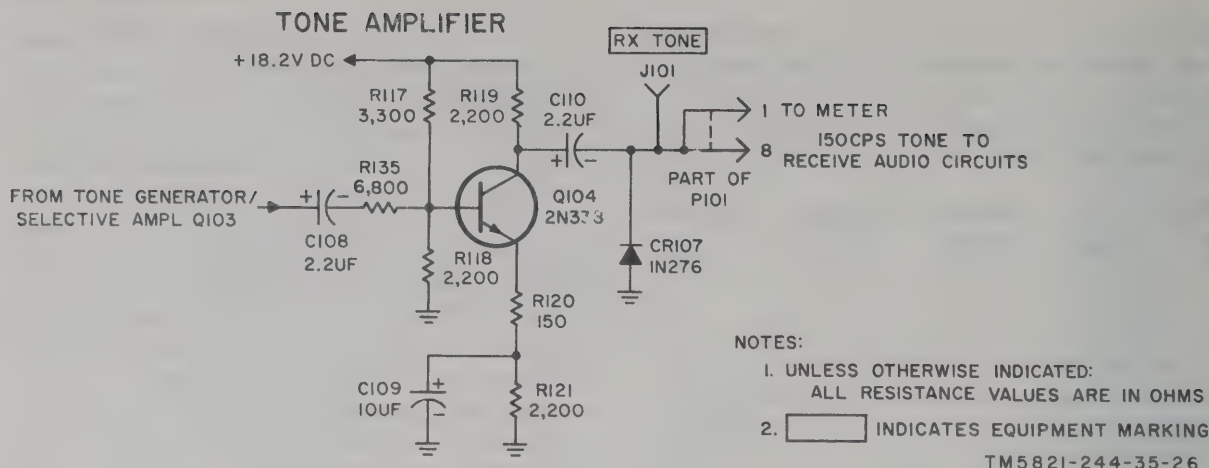


Figure 1-20. Tone amplifier, schematic diagram.

coupled from the collector of Q103 to final tone amplifier Q104. Resistors R106 and R107 determine the base bias for transistor Q102. Resistor R111 is the emitter swamping resistor for Q102 and resistor R115 is the emitter swamping resistor for Q103, both of which produce degenerative feedback. Resistor R114 is the collector-load resistor for Q103. Potentiometers R112 and R110 allow adjustment of bandwidth and receive center frequency. Resistor R108 allows adjustment of frequency in transmit mode.

b. Transmit Condition. In transmit condition, the tr bus voltage, applied at the junction of diodes CR102 and CR103, is negative; thus, the diodes are reverse-biased. With the diodes reverse-biased, resistor R108 and capacitor C105 are not shorted and now form part of the collector impedance for transistor Q102. With increased collector-load impedance, the signal developed at the base of transistor Q103 will be sufficient to overcome circuit losses, thereby causing the circuit to oscillate. The values of resistor R108 and capacitor C105 are such that the net collector resistance and capacitive reactance are equal and 45° phase shift results as in the amplifier application. The circuit has no input in transmit mode, but will operate as a free-running oscillator at the frequency at which regenerative feedback occurs (150 cps). The 150-cps tone is coupled to pin 2 of the module connector from the emitter of Q103. Resistor R116 drops the signal to the proper level for injection into the transmit audio module.

1-44. Tone Amplifier Q104

(fig. 1-20)

Tone amplifier, Q104 and associated components amplify the 150-cps tone to the level necessary to drive the receive audio circuits. The circuit is a conventional audio amplifier. Resistors R117 and R118 develop base bias, R119 is the collector-load resistor, and resistors R120 and R121 are the emitter-swamping resistors. Resistor R121 is bypassed by capacitor C109 to prevent excessive degeneration. The output is coupled from the collector of Q104, through coupling capacitor C110 to the receive audio module and to the test meter. Diode CR107 rectifies the signal to provide meter current when a path is completed in the meter circuit.

1-45. Noise Amplifiers Q105, Q106, and Q107

(fig. 1-21)

The noise amplifier is a three-stage bandpass amplifier. The amplifier passes a selected band of frequencies commonly occupied by random noise but higher than the audio signals. This band is chosen to prevent audio signals from the discriminator from opening the audio gate in the receive audio module. The amplifier consists of transistors Q105, Q106, and Q107 and associated components. Noise output from sel-call preamplifier Q101 is fed back into the module via the wiper arm of the squelch adjust potentiometer, to the

is repeated at a frequency determined by transformer T201. The rc networks comprising R202 and C218 and R201 and C201 provide fast switching in order to prevent transistor burnout. The amplitude of the output is determined by the turns ratio of the transformer.

1-48. 500-Kc Homing Amplifier Q204

(fig. 1-24)

After the right and left antenna energy is sampled by the diode switching circuit (para. 1-46), the signal is coupled through the RF amplifier, variable IF amplifier, fixed IF amplifier, and back to the homer module at P202. This 100-cps am signal is now superimposed on a 500-kc carrier. The 500-kc homing amplifier, consisting of transistor Q204 and associated circuitry, is a narrow bandpass amplifier, which eliminates all unwanted signal and noise that might affect the homing signal. The signal is coupled in through coupling capacitor C206, isolating resistor R212, and the input tank circuit consisting of L204, C207, and C208. The tank circuit is capacity-tapped to prevent loading the high-Q of the tank by the input impedance of transistor Q204. Resistors R214 and R215 form a voltage divider, which supplies base bias for Q204. Resistor R216 produces degenerative feedback, R217 is the emitter-swamping resistor, and capacitor C209 provides RF bypassing. The output tank circuit consists of L205, C219, C220, C211, and C212. Capacitors C211 and C212 are regative-temperature compensated to stabilize the output with temperature changes. The tapped output prevents excessive loading by the input impedance of the detector circuit.

1-49. Homing Detector Circuit

(fig. 1-24)

The output of the 500-kc homing amplifier is detected by diodes CR205 and CR206. Capacitor C213 provides low-pass filtering and the detected 100-cps, amplitude-modulated signal is developed

across dc return resistor R219 and coupled through coupling capacitor C214 to the base of 100-cps homing amplifier Q205.

1-50. 100-Cps Homing Amplifier Q205

(fig. 1-24)

The detected 100-cps signal from the 500-kc homing amplifier is amplified by Q205 and associated circuitry. Resistors R220, R221, and R222 form a voltage divider from +18 volts, which supplies bias voltage for transistor Q205. Capacitor C215 is a bypass capacitor. The gain of the stage can be adjusted by potentiometer R224 in the emitter circuit of Q205. Resistor R225 is the emitter-swamping resistor, and capacitor C216 provides rf bypassing to ground. Capacitor C217 filters the collector output. Mechanical chopper K201 is synchronized with the diode switching circuit (para. 1-46) to provide proper right-left meter movement in the homing indicator. The collector supply voltage is supplied through the wiper arm of potentiometer R227 and through dropping resistors R228 and R226. Adjustment of R227 provides homing indicator vertical needle centering. The output is applied to pins 1 and 2 of the module connector and may be monitored at jacks J202 and J203.

1-51. Signal-Strength Circuit, Q203

(fig. 1-25)

The signal-strength circuit consists of transistor Q203, diodes CR204 and CR211, and resistors R208 through R211. The signal-strength signal is obtained from the age voltage, applied to the base of emitter-follower Q203 from pin 4 of the module connector. Diode CR211 protects the homing indicator from overcurrent. Diode CR204 prevents the meter from reading negative. Resistor R211 is the meter sensitivity adjustment. The output from Q203 drives the horizontal (signal strength) indicating needle in the homing indicator.

HOMER SIGNAL STRENGTH AMPLIFIER

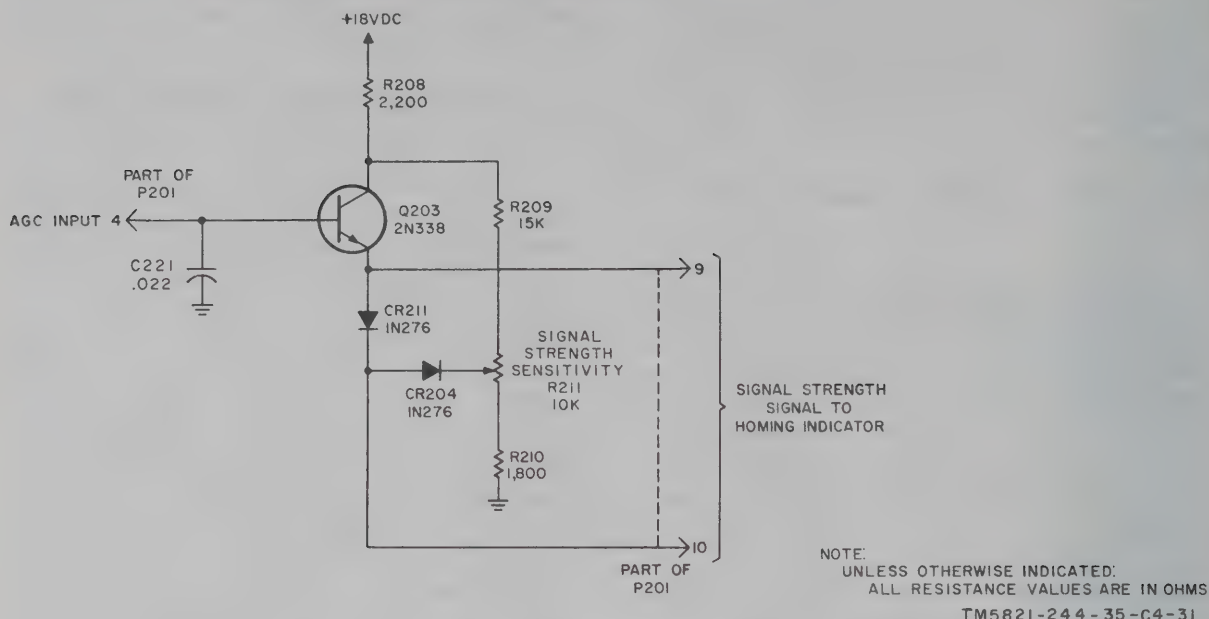


Figure 1-25. Homer signal-strength circuit, schematic diagram.

1-52. Despiking Circuit, Q1501, Q1504

(fig. 1-26)

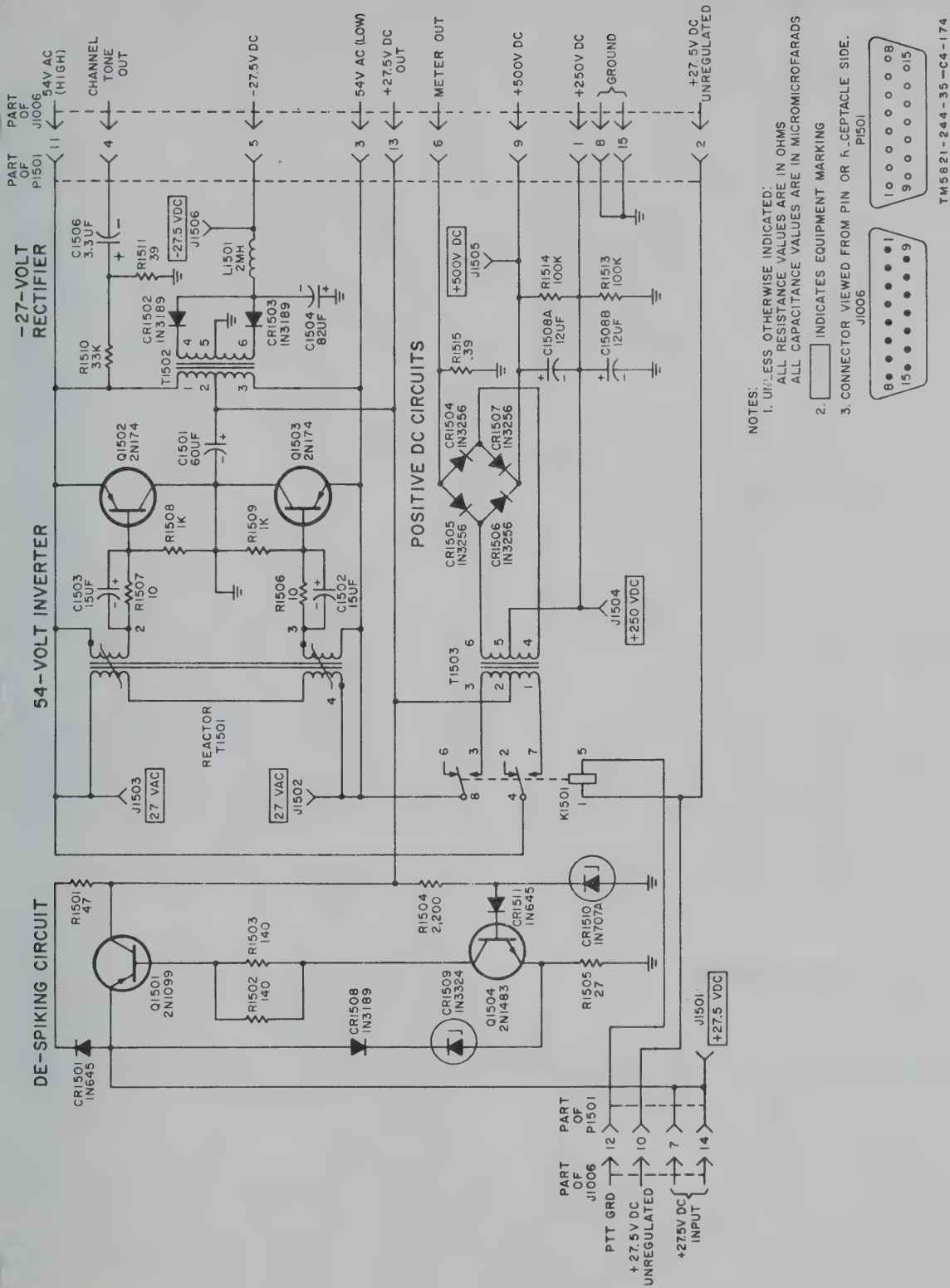
The despiking circuit removes positive spikes from the primary dc power by using a series switching transistor (Q1501) to open the dc line during high-amplitude positive spikes. During normal no-spike operation, switching transistor Q1501 is conducting because of the bias voltage supplied through switching transistor Q1504 and biasing resistors R1502, R1503, and R1505. Transistor Q1504 is biased on by a +6-volt dc level, which is regulated by Zener diode CR1510. Resistor R1504 limits current flow through CR1510. When a high-amplitude positive spike appears at the emitter of transistor Q1501, Zener diode CR1509 conducts through resistor R1505, increasing the positive voltage on the emitter of Q1504 and turning Q1504 off. With Q1504 turned off, the base bias is removed from transistor Q1501, turning Q1501 off for the duration of the spike. Resistor R1501 protects transistor Q1501 against high spike voltages. Positive spikes, which will tend to couple through diode CR1501 and resistor R1501, are bypassed to ground through filter capacitor C1501 in the square-wave oscillator circuit.

Diodes CR1501, CR1508, and CR1511 protect the despiking circuit against reverse voltage such as would occur if the aircraft battery were accidentally connected backward.

1-53. 54-Volt, Ac Inverter Q1502, Q1503

(fig. 1-26)

Fifty-four volts 800-cps ac is provided by a saturable-core, square-wave oscillator circuit. The circuit consists of saturable reactor T1501; transistors Q1502 and Q1503; resistors R1506 through R1509; capacitors C1501 through C1503; and the primary winding of transformer T1502. Positive 27 volts is applied to the circuit at the center tap of the primary of transformer T1502. Bias for transistor Q1502 is developed by the voltage divider consisting of resistors R1508 and R1507. Bias for transistor Q1503 is developed by the voltage divider consisting of resistors R1509 and R1506. Capacitor C1501 is the despiking capacitor described in paragraph 1-52. When operating voltage is applied to the circuit, both transistors will try to conduct. Because of circuit tolerances and minor differences in the conduction characteristics of the two transistors, one tran-



- NOTES:
1. UNLESS OTHERWISE INDICATED:
ALL RESISTANCE VALUES ARE IN OHMS
ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
 2. INDICATES EQUIPMENT MARKING
 3. CONNECTOR VIEWED FROM PIN OR K-CEPTACLE SIDE.



TM 11-5821-244-35-C4-174

Figure 1-26. Power supply module, schematic diagram

sistor will conduct harder than the other. Assuming that transistor Q1503 conducts hardest, current will flow through the path consisting of Q1503 and primary winding 2-3 of transformer T1502, and through the path consisting of Q1503, primary winding 1-4 of reactor T1501, and primary winding 1-2 of transformer T1502. Opposite-direction current flow through the primary windings of T1502 produces a voltage difference between terminals 1 and 3 that will increase toward a maximum of 54 volts. This voltage is applied across the primary of T1501, which is in parallel with T1502. Current flow through the primary of T1501, which induces voltages across the secondary windings of T1501. The polarities of the voltages are such that the voltage at terminal 3 is negative going while the voltage at terminal 2 is positive going. These voltages are coupled, through resistors R1506 and R1507, to transistors Q1502 and Q1503, causing Q1503 to conduct harder and causing Q1502 to turn off. Increased conduction of Q1503 causes increased current through the primary of T1501. This causes the core of T1501 to saturate and the induced voltage on the secondary windings falls rapidly to zero, allowing Q1503 to turn off. The magnetic field in T1501 then collapses, inducing voltages in the secondary windings that cause Q1502 to conduct and Q1503 to remain cut off. The cycle is repeated at a frequency of 800 cps, determined by the flux density of the transformer core. The rc networks in the base circuits of Q1502 and Q1503, R1507, C1503, R1506, and C1502 improve the high-frequency response of the oscillator, thereby providing faster switching of the transistors. This prevents overheating of Q1502 and Q1503.

1-54. Minus 27-Volt Rectifier

(fig. 1-26)

Ac power from the 800-cps square-wave oscillator is coupled through transformer T1502 to the -27-volt dc rectifier circuit consisting of diodes

CR1502 and CR1503 and capacitor C1504 and inductor L1501. Negative 27 volts dc is taken from the anode ends of diodes CR1502 and CR1503, which form a full-wave rectifier, and filtered by the 1c filter consisting of inductor L1501 and filter capacitor C1504.

1-55. Positive Dc Circuits

(fig. 1-26)

a. +500-Volt Power Supply Circuit. When the radio set transmit switch is closed, pin 12 of the module connector is connected to ground, energizing relay K1501. With relay K1501 energized, the primary winding of transformer T1503 is connected in parallel with the primary winding of transformer T1502. The 54 volts ac is stepped up to 500 volts through the transformer T1503 and rectified by the full-wave bridge rectifier consisting of diodes CR1504 through CR1507. Ac ripple is bypassed to ground through filter capacitors C1508A and C1508B. Resistors R1513 and R1515 bleed the 500-volt supply to equalize the voltages across C1508A and C1508B. A sample of the 500-volt power supply output is provided at pin 6 of the module connector for the radio set TEST METER. Resistor R1515 is a shunt resistor for the test meter.

b. +250-Volt Power Supply Circuit. The secondary winding of transformer T1503 is center-tapped to provide a 250-volt output. The 250 volts is rectified by diodes CR1504 and CR1505 and filtered by capacitor C1508B. Resistor R1513 is the bleeder resistor for +250-volt supply.

1-56. Mechanical Drive Circuits

(fig. 6-20)

The mechanical drive circuits in the mechanical drive module are part of the autopositioner system which includes switches in the control unit and the RF subchassis mechanical tuning assembly. A complete circuit analysis of the tuning system (including the mechanical drive circuits) is given in paragraphs 1-78 through 1-91.

Section IV. RECEIVER-TRANSMITTER INTRAUNIT CIRCUIT FUNCTIONING

1-57. Intraunit Power Distribution and Regulation Circuits

(fig. 6-21)

Paragraphs 1-58 through 1-62 explain distribution and regulation of primary power and dc and ac operating power within the receiver-transmitter unit to clarify intercircuit relationships that were not evident in the separate stage analyses in paragraphs 1-9 through 1-56.

1-58. Distribution of Primary Power

(fig. 6-21)

Unregulated +27.5 volts dc primary power is supplied to the receiver-transmitter unit at pins 16, 18, 34, and 36 of main power connector P1005. This voltage is coupled through line filter FL1001. The voltage at pin 16 is present only when the mode control on the control unit is set to the HOME position. This voltage is coupled to pin 8 of homer module connector P201 to operate the homing circuits. The +27.5 volts dc at pins 18, 34, and 36 is connected to a common point, then coupled through fuses F1001 and F1002 to pins 7 and 10 of power supply module connector P1501. The voltage at pin 10, fused by F1001, is supplied through pin 3 of P1501 to the RF subchassis relays and filament circuits. The voltage is coupled into the RF subchassis through main subchassis connector P901 pins 15 and 16 from main chassis connector J1007. The voltage at pin 16 of P901 is supplied to pin 16 of mechanical drive module connector P701 to operate the relays and drive motor in the mechanical drive module. The voltage at pin 16 of P901 is also supplied, through pin 15 of P701, to pin E of RF amplifier module connector J601 to operate relay K601 in the RF amplifier module. The voltage at pin 15 of RF subchassis connector P901 is supplied to pin C of power amplifier module connector FL801 (a combination connector and RF interference filter). This voltage is the filament supply for the three tubes in the power amplifier module. The voltage at pin 10 of power supply module connector P1501 is also supplied to relays K1001 and K1002 on the main chassis and to contact 1 of TEST SWITCH S1001A for +27.5-volt metering. In addition, the voltage is supplied, through har-

monic filter module connector J1601 pin E, to relays K1601 and K1602 in the harmonic filter module. Resistor R1007 and diode CR1001 provide reverse-voltage protection if the primary power is accidentally applied to the radio set with the wrong polarity. The voltage at pin 7 of power supply module connector P1501, fused by F1002, is used by the power supply to provide despiked operating voltages of +27.5, -27.5, +500, and +250 volts dc and 54 volts ac.

1-59. Distribution of +27.5 Volts (Despiked)

(fig. 6-21)

The power supply module removes high-amplitude spikes from the +27.5-volt supply and supplies the despiked voltage to pin 13 of P1501. The despiked (but unfiltered) voltage is supplied through 100-cps filter FL1002 to contact 6 of tr bus relay K1001. When the radio set is in receive condition, K1001 is deenergized and the +27.5 volts at contact 6 is supplied through contact 4 to diode switch CR1301 in the receive audio and diode switches CR102 and CR103 in the sel-call module on the main chassis; and to the hfo diode switch in the RF amplifier, and the lfo diode switch in the variable IF module on the RF subchassis. The +27.5 volts despiked is also coupled through 100-cycle filter FL1002 to the receive audio, transmit audio, homer, fixed IF and sel-call modules on the main chassis and to the RF subchassis through pin 17 of chassis connector P901 to Zener diode CR901. The filtered, despiked +27.5 volts is supplied to the receive audio module through pin 12 of module connector P1301. In the receive audio module the voltage is supplied directly to relay K1301, audio power amplifier, diode switching circuits, and reduced to a regulated +18 volts for other transistors in the module by Zener diodes CR1307 and CR1308 and dropping resistors R1325 and R1326. Zener diode CR1318 and resistor R1339 provide +8.2 volts for audio gate circuit biasing. The filtered and despiked +27.5 volts is supplied to the transmit audio module through pin 4 of module connector P1401. In the transmit audio module, the voltage is supplied directly to relay K1401 and reduced by Zener diode CR1401 and dropping resistor R1432 to +18 volts to oper-

ate transistors Q1401, Q1402, and Q1403. Zener diode CR1402 and dropping resistor R1425 reduce the voltage still further to +6.8 volts to operate the fm modulator, varactor C1415. The filtered and despiked +27.5 volts is supplied to the homer module through pin 7 of module connector P201. In the homer module, the voltage is reduced to +18 volts by Zener diode CR207 and dropping resistor R213 to operate transistors Q203 and Q204. The filtered and despiked +27.5 volts is supplied to the fixed IF module through pin 9 of module connector P1205. In the fixed IF module, the voltage is reduced to +18 volts by Zener diode CR1206, inductor L1206, and dropping resistors R1231 and R1243. This voltage operates all the transistors in the module. The filtered and despiked +27.5 volts is supplied to the sel-call module through pin 5 of module connector P101. In the sel-call module, the voltage is reduced to +18 volts by Zener diode CR104 and dropping resistor R123 to operate transistor Q101. Zener diodes CR105 and CR106 and dropping resistor R124 provide +18.2 volts for the rest of the transistors in the module. The filtered and despiked +27.5 volts at pin 17 of RF subchassis connector P901 is reduced to +18 volts by Zener diode CR901 and dropping resistor R901 and supplied to the transmitter mixer in the RF amplifier module, and the IF amplifier, low-frequency oscillator, and high-frequency oscillator in the variable IF module. The regulated +18 volts is supplied to the RF amplifier module through pin B of module connector J601, to the variable IF module through pin C of module connector J506, to the low-frequency oscillator module through pin A of module connector J402, and to the high-frequency oscillator module through pin A of module connector J302.

1-60. Distribution of -27.5 Volts

(fig. 6-21)

The power supply module supplies -27.5 volts (despiked) through pin 5 of module connector P1501 to contact 2 of TEST SWITCH S1001B for -27.5-volt metering, to contact 7 of tr bus relay K1001, and, through chassis connector J1007 and RF subchassis connector P901 (pin 14), to the power amplifier module. The voltage is supplied to the power amplifier module through pin

E of module connector FL801 and provides bias for tube

V803. The -27.5 volts at contact 7 of tr bus relay K1001 is supplied, when the radio set is in the transmit mode (K1001 energized), through contact 4 to the tr bus. Distribution of this voltage is the same as distribution of the +27.5-volt tr bus voltage (when the radio set is in receive mode) (para. 1-59).

1-61. Distribution of 54 Volts Ac

(fig. 6-21)

The power supply module supplies 54 volts ac, 800 cps at pins 3 and 11 of module connector P1501. This ac voltage operates blower B1001 and provides a channel tone for the radio set (output not shown).

1-62. Distribution of +500 and +250 Volts

(fig. 6-21)

The power supply module supplies +500 and +250 volts at pins 9 and 1 respectively of module connector P1501. These voltages are supplied to the power amplifier module for plate and screen-grid voltages for the tubes. The +500 volts is supplied, through pin 23 of main chassis connector J1007 and RF subchassis connector P901, to pin A of power amplifier module connector FL801, and to the plate of V803. Also, the 500 volts DC is connected through pin 6 of P1501 to contact 9 of TEST SWITCH S1001B for metering. The +250 volts is supplied, through pin 12 of main chassis connector J1007 and RF subchassis connector P901, to pin B of power amplifier module connector FL801, and to the plates of V801 and V802.

1-63. Metering Circuit

(fig. 1-27)

a. TEST SWITCH S1001, on the receiver-transmitter unit front panel, selects various operating voltages and outputs and applies them, through proper series resistances when necessary, to the TEST METER. TEST METER M1001, also on the receiver-transmitter unit front panel, displays these voltages to provide a quick check of the performance of the radio set. The test switch positions are marked with numbers 1 through 12. A chart marked TEST SWITCH POSITIONS tells what is measured in each position.

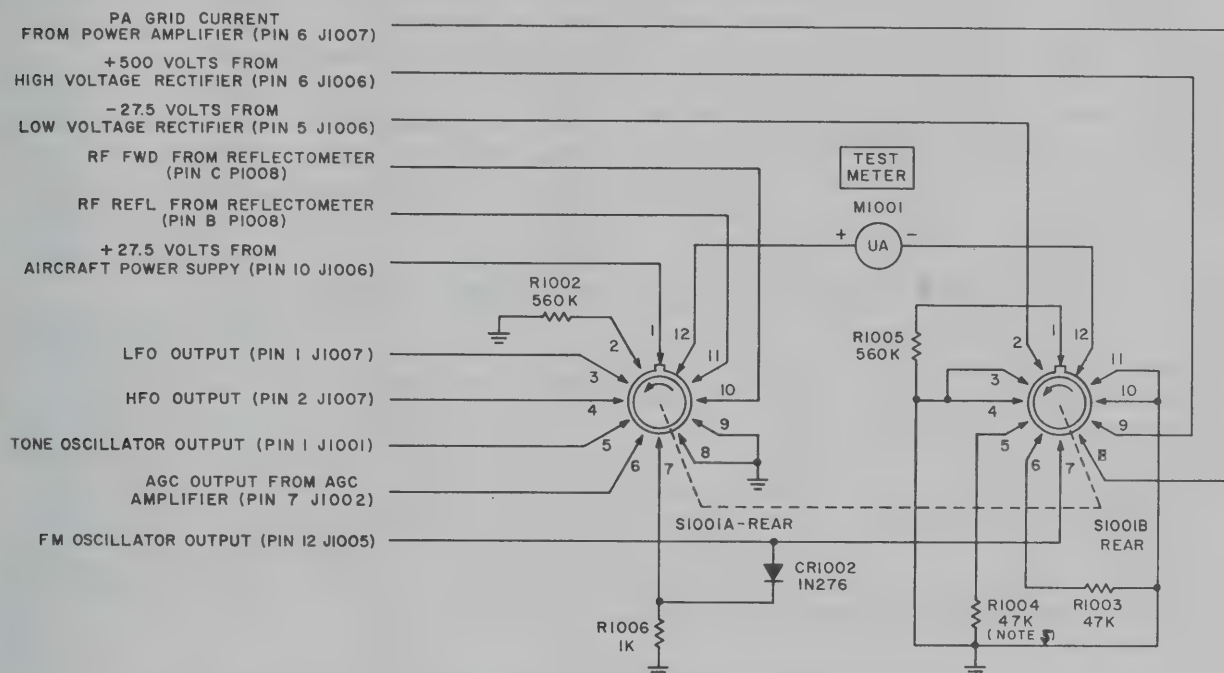
b. In position 1, +27.5 volts is applied to the positive meter terminal (contact 1, to contact 12, to the meter). The negative meter terminal is connected to contact 12 of S1001B, which is shorted to contact 1. Contact 1 is connected through resistor R1005 to ground. The meter requires 100 microamperes for full-scale deflection so +27.5 volts, applied through R1005 (560K ohms) provides half-scale deflection.

c. In position 2, -27.5 volts is applied to the negative meter terminal through S1001B (contact 2, to contact 12, to the meter). The positive meter terminal is connected through S1001A (contact 12 to contact 2) then through R1002 to ground. Re-

sistor R1002 is also 560K ohms so again a normal reading is approximately half-scale deflection.

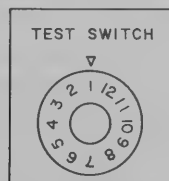
d. In position 3, a portion of the output of the low-frequency oscillator is applied to the positive meter terminal through S1001A (contact 3, to contact 12, to the meter). The negative meter terminal is connected to ground through S1001B (contact 12 to contact 3 to ground). In this case, no series resistor is used because the voltage being measured is the right value to produce approximately half-scale deflection.

e. In position 4, a portion of the output of the high-frequency oscillator is applied to the positive meter terminal through S1001A (contact 4, to con-



NOTES:

1. UNLESS OTHERWISE INDICATED:
ALL RESISTANCE VALUES ARE IN OHMS
2. INDICATES EQUIPMENT MARKING
3. SWITCH POSITIONS OF S1001 AND POSITION FUNCTIONS



S1001

4. SECTIONS DESIGNATED A ARE NEAREST THE CONTROL KNOB. FRONT OF SECTION IS SIDE TOWARD CONTROL KNOB
5. R1004 (68K) ON ORDER NO.28-043-P6-00099, AND 00634, 22159, 22034

TM5821-244-35-C4-35

Figure 1-27. Metering circuit, schematic diagram

tact 12, to the meter). The negative meter terminal is connected to ground through S1001B (contact 12 to contact 4 to ground). Again the voltage being measured is small enough that no series resistance is required.

f. In position 5, a portion of the tone oscillator output is applied to the positive meter terminal through S1001A (contact 5, to contact 12, to the meter). The negative meter terminal is connected through S1001B (contact 12 to contact 5) then through resistor R1004 to ground. Resistor R1004 limits the meter current to provide approximately half-scale deflection for normal tone oscillator output.

g. In position 6, a portion of the age voltage is applied to the positive meter terminal through S1001A (contact 6, to contact 12, to the meter). The negative meter terminal is connected through S1001B (contact 12 to contact 6) then through resistor R1003 to ground. Resistor R1003 limits meter current to provide approximately half-scale deflection for normal age levels.

h. In position 7, a portion of the fm oscillator output is applied to the negative meter terminal through S1001B (contact 7, to contact 12, to the meter). The positive meter terminal is connected through S1001A (contact 12 to contact 7) then through resistor R1006 to ground. Resistor R1006 limits the meter current to provide approximately half-scale deflection for normal fm oscillator output. Diode CR1002 shunts the meter to limit reverse meter current with positive half-cycles of fm oscillator output.

i. In position 8, a portion of the final power amplifier stage control grid current is applied to

the negative meter terminal through S1001B (contact 8, to contact 12, to the meter). The positive meter terminal is connected to ground through S1001A (contact 12, to contact 8, to ground). This current provides approximately half-scale deflection when the final power amplifier stage is conducting normally.

j. In position 9, a portion of the +500-volt power supply output is applied to the positive meter terminal through S1001B (contact 9, to contact 12, to the negative meter terminal). The positive meter terminal is connected to ground through S1001A (contact 12, to contact 9, to ground). Meter shunting resistor R1515 in the power supply module limits meter current to provide approximately half-scale deflection for normal power supply output.

k. In position 10, a portion of the RF forward power is applied to the positive meter terminal through S1001A (contact 10, to contact 12, to the meter). The negative meter terminal is connected to ground through S1001B (contact 12, to contact 10 to ground). Normal forward power provides approximately half-scale deflection.

l. In position 11, a portion of the RF reflected power is applied to the positive meter terminal through S1001A (contact 11, to contact 12, to the meter). The negative meter terminal is connected to ground through S1001B (contact 12, to contact 11, to ground).

m. In position 12, both meter terminals are terminated in an open circuit (contact 12 of S1001A and contact 12 of S1001B). This is the OFF position.

Section V. FUNCTIONING OF CONTROL, RADIO SET C-3835/ARC-54

1-64. Introduction

(fig. 6-22)

All the radio set operator controls and indicators are located on Control, Radio Set C-3835/ARC-54. These include mode control S101, SQUELCH control S102, volume (VOL) control R101, the frequency-select controls (S103 and S104), and the frequency indicator. The operation of these controls and indicators are explained in paragraphs 1-65 through 1-68.

1-65. Mode Control S101

(fig. 6-22)

The mode control (S101) is a four-position, three-wafer switch. The switch applies primary power to the receiver-transmitter and selects the mode of operation (OFF, PTT, RETRAN, HOME). Section S101A switches control grounds, S101B switches audio signals, and S101C switches primary power.

a. PTT Position. When the mode control (S101) is in the PTT position, primary +27.5-volt

above will occur. If the noise amplitude is high, the audio gate will open and audio will not pass. The noise can be grounded, thus disabling squelch control of the audio gate, by depressing SQ DIS switch S1002 on the receiver-transmitter unit. This has the same effect as switching the SQUELCH control on the control unit to the DIS position.

c. Tone Squelch Mode (TONE). When SQUELCH control S102 is set to TONE, the ground at contact 7 is connected through contact 8 to pin X of the control unit connector. From pin X, the ground (squelch tone ground) is connected through interconnecting wiring to pin 9 of the receiver-transmitter unit connector. From pin 9, the ground is connected to pin 7 of the receive audio module connector. This ground biases diode CR 1306 on. The ground also biases CR1313 through R1334 so that tone signal from pin 8 of the module connector can enter the voltage tripler circuit. The output of the voltage tripler (a dc potential derived from the tone signal) biases transistor Q1302 off, turn-

ing Q1303 on to complete a path for audio to pass (through Q1303 and CR1306). The tone, part of the discriminator output (fixed IF module), is coupled into the selective calling module through pin 3 of the module connector. The tone signal (if present) is amplified by sel-cal preamplifier Q101; then by tone generator selective amplifier Q102 and Q103; then by tone amplifier Q104. The amplified tone is then coupled through pin 8 of the selective calling module connector to pin 8 of the receive audio module connector where it is used, as described above, to close the audio gate. In the absence of a 150-cps tone, Q1303 will remain off, thus preventing audio from passing. All audio that passes through the audio gate is amplified by the audio drive amplifier Q1304 and audio power amplifiers Q1305 and Q1306, then coupled out through pins 14 and 15 of the receive audio module connector, through pins 13 and 14 of the receiver-transmitter unit connector, to the aircraft interphone set.

Section VII. RADIO SET AN/ARC-54 TUNING SYSTEM PRINCIPLES

1-78. Introduction

(figs. 1-31, 1-32, 1-33, and 6-24)

a. Receiver-Transmitter, Radio RT-348/ART-54 operates on any of 800 frequency channels within range from 30 through 69.95 mc in increments of 0.05 mc. The operating frequency is selected at Control, Radio Set C-3835/ARC-54 and the actual tuning takes place in Receiver-Transmitter, Radio RT-348/ARC-54 and Antenna Couplers CU-942/ARC-54, CU-942B/ARC-54, and CU-943/ARC-54. The control unit provides whole- and decimal-mc control information to the mechanical tuning assembly in the receiver-transmitter unit.

b. The mechanical tuning assembly is a motor-driven electromechanical actuator, which simultaneously tunes the tank circuits in the variable IF, RD, and power amplifiers and inserts the power crystals in the high- and low-frequency oscillators as the operator selects the frequencies at the control unit. The mechanical drive assembly consists of two autotuner circuits, a drive motor, a differential, and several gear trains and positioning cams. The autotuner circuit is a solenoid-operated, motor-driven rotary positioning mechanism which provides automatic and precise selection of any one of a number of fixed positions, each of which is determined by switch

combinations operating the solenoid. A single unidirectional motor drives both autotuner circuits through gear trains and slip clutches. One autotuner circuit tunes the receiver-transmitter in 1-mc increments; the other autotuner circuit tunes the receiver-transmitter in 0.05-mc increments.

c. The tuning mechanism in the Antenna Couplers CU942/ARC-54 and CU943/ARC-54 is similar to the autotuner circuit used in the receiver-transmitter unit. The Antenna Coupler CU942B/ARC-54 is completely solid state and contains only passive circuits. No internal switching is employed; therefore, no dc power is required to tune the CU942B/ARC-54. The couplers provide constant impedance matching between the antenna and the receiver-transmitter.

1-79. Basic Autotuner Circuit

(fig. 1-31)

a. Circuit Elements. An autotuner is a motor-driven rotary mechanism which rotates a shaft and any devices attached to the shaft to any one of a predetermined number of positions. A basic autotuner circuit includes a manually operated remote control switch S1, and open-seeking switch S2, a motor control relay K1, a stop-

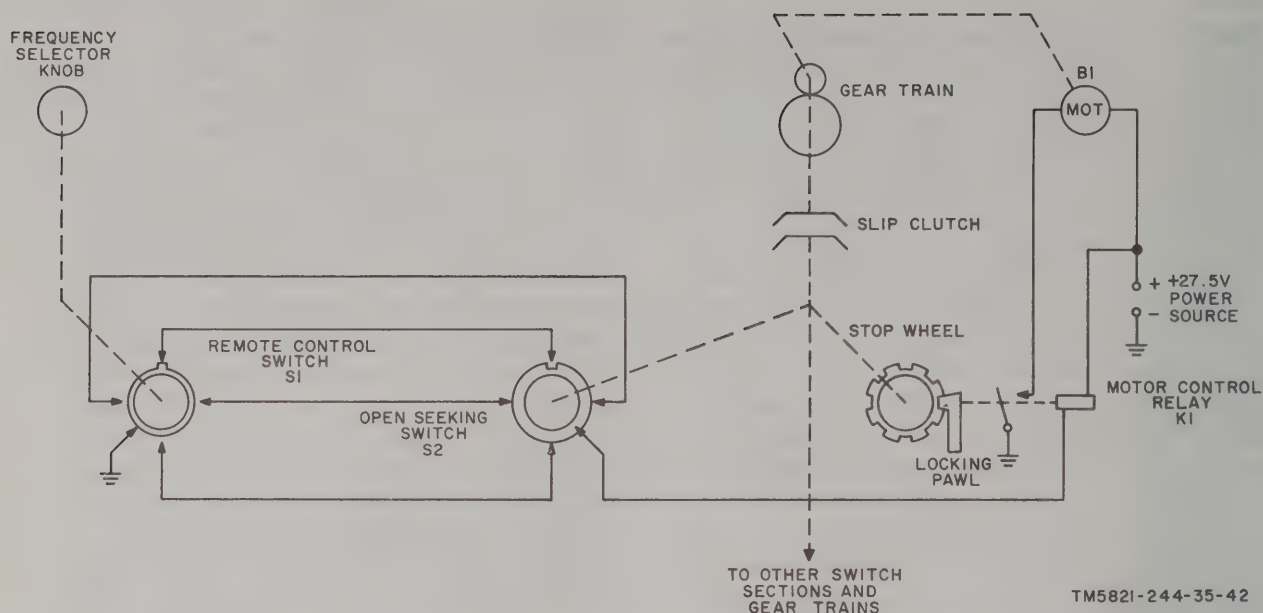


Figure 1-31. Basic autopositioner circuit, simplified schematic diagram.

wheel and locking pawl mechanism, a dc motor B1, and a slip clutch. The autopositioner converts frequency control switch position information at a remote radio set control unit into degrees of tuning shaft rotation at the receiver-transmitter unit.

b. Circuit Operation. The simplified autopositioner circuit shown in figure 1-31 is at rest because there is no ground return path for the motor control-relay solenoid through the open-seeking switch and the remote control switch. The open-seeking switch is driven by the gear train which drives the associated tuning shaft. The tuning shaft tunes the applicable receiver circuit elements of the receiver-transmitter unit to the frequency indicated on the control unit dial. When the frequency control is moved to select a different frequency digit, switch S1 is rotated so that a ground return path is completed to the control relay solenoid through open-seeking switch S2. The rotors of the two switches, S1 and S2, are constructed so that for each control position, only one specific position of open-seeking switch S1 will open the ground return path for the relay solenoid. When a new position is selected, the relay solenoid energizes and closes contacts which provide a ground return circuit for motor B1. The relay also removes the locking pawl from the stop-wheel notch. This action allows the energized motor to drive the gear train through the slip clutch.

While the gear train turns the output shaft it also turns the open-seeking switch. When the tuning shaft position corresponds with the selected frequency, the open-seeking switch opens the ground return circuit from the relay to switch S1. As a result, the control relay deenergizes and opens the ground return circuit for the dc motor. This action stops the motor and releases the locking pawl. The locking pawl engages a notch in the stop wheel and prevents further rotation of the gear train. The slip clutch provides a dual function. It dissipates the kinetic energy of the motor and allows the motor to drive more than one shaft. The autopositioner circuit remains at reset until the remote frequency control knob is turned to select a new frequency. Two basic autopositioner circuits are used to tune Radio Set AN/ARC-54 from 30 to 69.95 in 0.05-mc stops. The two autopositioner circuits control and share a single dc motor. Separate slip clutches are used to isolate the open-seeking switches and stop wheels of each autopositioner circuit from the motor drive assembly. As soon as each autopositioner circuit completes a tuning cycle, the stop wheels and associated locking pawls prevent further rotation of the associated open-seeking switches and tuning shafts. However, the slip clutch allows the remaining autopositioner circuit to continue its

signal is mixed with the highest frequency produced by the oscillator, 5.425 mc, to provide the 500-kc fixed IF signal. When the radio set is tuned to 31 mc, the incoming IF signal increases to 4.925 mc, and the low-frequency oscillator signal decreases to its lowest value, 4.475 mc. The difference between these two signals, however, is 500 kc. In this case low-side injection is used. This tuning sequence continues throughout the frequency range of the radio set, with high-side injection used on even-mc bands and low-side injection used on odd-mc bands.

1-81. Frequency Selection Code

a. The whole- and 0.05-mc frequency selector switches in Control, Radio Set C-3835/ARC-54 develop a frequency selection code which controls the operation of the autopositioner circuits in the mechanical drive module in the receiver-transmitter unit. The selection code for each of the 800 available frequency channels is developed by grounding specific combinations of 10 frequency control wires. Two multiwafer rotary switches (S103 and S104) determine the combinations of frequency control wires which are grounded. The manually operated frequency selector knobs drive the rotary wafer switches.

b. The whole-megacycle frequency selector control (on the control unit) drives 20-position wafer switch S103 and the indicator dials for the

first two digits (whole-megacycle frequency) which appear in the dial window. Each switch position corresponds to a 1-mc increment of operating frequency. The frequency range from 30 to 69 mc is covered in 40 steps. Since the wafer has only 20 positions, it must turn 2 revolutions to select the 40 one-megacycle increments; subsequently, the control information furnished the autopositioner circuits is ambiguous. That is, the same coding information is supplied during the second revolution of the switch that is supplied during the first revolution. Additional wafers on switch S103 supply ambiguity code information to the autopositioner circuits. The following chart lists the coding applied to combinations of the five whole-megacycle control wires for all frequency selections. The five control wires are designated (for reference purposes) 1-A through 1-E. In the chart, an X designates each control wire that is grounded for each specific pair of frequency selections.

c. The 0.05-mc control on the control unit drives 20-position rotary wafer switch S104 and the indicator drum for the third and fourth digits (decimal-megacycle frequency) that appears in the dial window. Each switch position corresponds to a 0.05-mc change in operating frequency. For each complete revolution of the switch, the frequency range from XX.0 to XX.95 mc is covered. Rotary wafer switch S104 provides coding informa-

Control wire	Position of 1-megacycle shaft																			
	30 50	31 51	32 52	33 53	34 54	35 55	36 56	37 57	38 58	39 59	40 60	41 61	42 62	43 63	44 64	45 65	46 66	47 67	48 68	49 69
1-A-----	X					X	X			X	X	X		X	X	X	X			
1-B-----		X					X	X			X	X	X		X	X	X	X		
1-C-----			X					X	X			X	X	X		X	X	X	X	
1-D-----				X					X	X			X	X	X		X	X	X	
1-E-----	X				X					X	X			X	X	X		X	X	X

Control wire	Position of .05-megacycle shaft																			
	.00	.05	.10	.15	.20	.25	.30	.35	.40	.45	.50	.55	.60	.65	.70	.75	.80	.85	.90	.95
.05-A-----	X					X	X			X	X	X		X	X	X	X			
.05-B-----		X					X	X			X	X	X		X	X	X	X		
.05-C-----			X					X	X			X	X	X		X	X	X	X	
.05-D-----				X					X	X			X	X	X		X	X	X	X
.05-E-----	X				X					X	X			X	X	X		X	X	X

tion for the five control wires designated .05-A through .05-E. The following chart indicates the combinations of control wires that are grounded for each specific 0.05-mc frequency selection.

1-82. Whole-Megacycles Tuning Circuit

(fig. 6-24)

a. The whole-megacycles autopositioner circuit includes control unit whole-megacycle selector switch S103, open-seeking switch S701, a 20-position stop wheel, a locking pawl assembly, motor control relay K701, a slip clutch and drive assembly and a tuning shaft. The 1-mc autopositioner circuit controls the receiver-transmitter unit tuning from 30 to 69 mc in 1-mc steps. A similar circuit, using part of S103 in the control unit and S103 in the antenna coupler, controls the drive motor in the antenna coupler.

NOTE

The Antenna Coupler CU942B/ARC-54 is a passive, broad-band device, with no switching of frequency selecting circuits.

The antenna coupler tuning provides the proper output impedance for the receiver-transmitter unit at all frequencies. Control wires (designated 1-A through 1-E in fig. 6-24) carry the binary frequency control information from whole-megacycle control switch S103 in the control unit to open-seeking switch S701 in the receiver-transmitter unit. A separate set of wires, similarly designated, carries the same information to S103 in the antenna coupler. For each frequency within the 30- to 69-mc range, the whole-megacycle selector switch applies a specific combination of ground connections to the two groups of control wires (para. 1-81). In figure 6-24, the switch is shown in the 30-mc position. In this position, the control wires for the receiver-transmitter unit are connected to ground through the front section of switch wafer S103A, and the control wires for the antenna coupler are connected to ground through the front section of S103B.

b. The aircraft interconnecting cables connect the control wires between the control unit and the receiver-transmitter unit and between the control unit and the antenna coupler. At the receiver-transmitter unit, the control wires are connected to a low-pass filter circuit, FL1001 (not shown),

which reduces the amount of radiofrequency interference that is conducted from the receiver-transmitter unit. The control wires are connected from the filter to contacts on the front and rear sections of open-seeking switch wafer S701A through connectors J1008, P1001, J1007, P901, J901, and P701. Open-seeking switch S701 is shown at rest in the 30-mc position (fig. 6-24). Control lines mc select A and mc select E, which are connected to contacts 16 and 20. These contacts are adjacent to detents in the rear rotor of switch section S701A, and, therefore, do not connect the solenoid of relay K701 to ground. Note that the long wiping contact 1 on the rear portion of switch section S701A is connected to the negative side of the solenoid; therefore, when a contact that is connected to a grounded control wire is adjacent to a tab on the rotor, the relay is energized and the motor turns the tuning shaft.

c. When the whole-megacycle control is turned to any other position, a ground return path from relay K701 is completed through switch wafer S103A in the control unit. As an example, assume that the whole-megacycle selector is moved to the 31-mc position. This rotates whole-megacycle selector switch S103A 18° clockwise, connecting control wire mc select C to ground through contacts 12 and 18 on the front section of switch wafer S103A. As a result, a ground return circuit for the motor control relay solenoid is completed through contacts 18 and 1 on the rear section of switch wafer S701A. Since the positive side of the relay is permanently connected to +27.5 volts dc, relay K701 energizes. This action simultaneously closes motor control contacts 3 and 4 and disengages the pawl from the stop-wheel notch. The closed motor control contacts complete a dc ground return path for drive motor B701, and the motor rotates the 1-mc tuning shaft through the drive gear and slip clutch assembly. The drive motor also rotates open-seeking switch S701 and the stop wheel. The rotors of switch wafers S701A and S701B are mounted directly on the tuning shaft, and the rotors of switch wafer S701C are driven through a 4:1 speed-reducing gear train so that it rotates at one-fourth the speed of switch wafer S701A and S701B. The drive motor continues to turn the tuning shaft until the rotors of switch wafer S701A move to discrete positions that open all possible

groundpaths at the negative side of relay K701. The relay then deenergizes and releases the locking pawl. The locking pawl engages a notch in the

stop wheel and simultaneously opens contacts 3 and 4 on the relay. This action opens the ground circuit of motor B701.

and couples the received signal into the second transmitter for retransmission.

b. The relay station may be operated in either carrier squelch or tone squelch mode. (Squelch disable mode cannot be used for retransmit operation.) The radio set transmitter control circuits are interlocked by retransmit control relays to assure that the two radio sets will not transmit simultaneously and that the two radio sets will not oscillate between receive and transmit modes. Figure 1-34 is a simplified block diagram showing the retransmit relays in their deenergized condition (both radio sets in receive mode with no signal received).

1-93. Retransmit Operation

(fig. 1-34)

a. *Retransmit Circuit, Static Condition.* The radio sets are in the static condition when no signals are being received or transmitted and both radio sets are in receive mode.

- (1) *Carrier squelch mode.* In carrier squelch mode, both the receive audio module retransmit relays (K1301) are deenergized because no carrier signal is present in either radio set. (See para. 1-39 for operation of relay K1301.) With these relays deenergized, the carrier retransmit ground return paths for the PTT (push-to-talk) buses are open, thus both transmitters are deactivated.
- (2) *Tone squelch mode.* In tone squelch mode, both the receive audio module retransmit relays (K1301) are energized during the absence of a tone signal. With these relays energized, the tone retransmit ground return paths for the PTT buses are open, thus both transmitters are deactivated.

b. *Retransmit Circuit, Dynamic Condition.* In the following discussion consider that radio set No. 1 first receives a signal.

- (1) *Carrier squelch mode.* When a signal is received by radio set No. 1, the noise level in the radio set decreases because of squelch action. The decrease in noise level operates the audio gate in the receive audio module, allowing retransmit switch

Q1307, in radio set No. 1 receive audio module, to conduct, thereby energizing relay K1301. With K1301 energized, the carrier retransmit groundpath is completed allowing the ground, which originates in the transmit audio module, to be applied through the closed contacts of K1301, and then through the control units to the PTT bus of radio set No. 2. At the same time, the received signal is coupled from radio set No. 1 through the control units to the transmit circuits of radio set No. 2. The ground, placed on radio set No. 2 PTT bus, simultaneously keys the transmitter and energizes K1401. Since amplifier Q1307, in the receive audio module of radio set No. 2, is operated by the squelching of noise in the radio set (para. 1-39a), relay K1301 energizes during the presence of a transmitted carrier just as it does with a received carrier. To prevent this action from completing a groundpath that would energize the transmit circuits of radio set No. 1, the path is broken by the operation of relay K1401 in the transmit audio module (radio set No. 2). (Relay K1401 operated immediately upon application of the PTT ground, while the operation of K1301 was slightly delayed because of the time required for squelching.) Relay K1401 remains energized for a short time after the termination or interruption of the receiver signal. (See para. 1-15 for details of relay interlock circuit operation.) This delay is necessary because of the time required for receiver squelching. If K1401 were allowed to deenergize rapidly at the end of the receive-transmit cycle, relay K1301 (radio set No. 2), which can deenergize only after the radio set is squelched, would provide a completed path that would place radio set No. 1 in transmit mode. Radio set No. 1 would transmit a carrier until K1301 finally deenergized, at which time K1401 in radio set No. 1 would provide a ground back to radio set No. 2. The result would be that the two radio sets would con-

tinue to transmit carriers back and forth to each other effectively disabling the relay station.

(2) Tone squelch mode. Retransmit operation in tone squelch mode is the same as in carrier squelch mode except that the retransmit ground-

path is completed when relay K1301 is deenergized instead of when K1301 is energized. Relay K1301 is energized in the static (no signal) condition and will deenergize when a tone signal is present. (See para. 1-39b for operation of K1301 in tone squelch mode.)

Section IX. FUNCTIONING OF ANTENNA AS-1703/AR AND ANTENNA COUPLERS CU-942/ARC-54, CU942B/ARC-54, AND CU-943/ARC-54

1-94. General

The communications antenna system for Radio Set AN/ARC-54 consists of a whip antenna (Antenna AS-1703/AR) and an impedance-matching coupler (Coupler, Antenna CU942/ARC-54, CU942B/ARC-54, or CU943/ARC-54). The antenna and coupler are both mounted to the external surface of the aircraft. (The coupler is housed in a streamlined fiberglass housing.) The coupler provides impedance matching between the antenna and the receiver-transmitter unit for all channels within the frequency range of the radio set (30.00 to 69.95 megacycles). The antenna couplers CU942/ARC-54 and CU943/ARC-54 contain impedance-matching circuits which are selected by rotary switches driven by an electric motor. The motor is part of a seeking switch circuit similar to the autopositioner circuit in the receiver-transmitter unit. The antenna couplers have one impedance-matching circuit for each whole-megacycle setting of the radio set. The impedance-matching circuits maintain a voltage standing wave ratio (VSWR) of 2 to 1 from 40 to 70 megacycles and 3 to 1 from 30 to 40 megacycles. The Antenna Coupler CU942B/ARC-54 is specifically designed to match the AN/ARC-54 to the AS-1703/AR without any internal switching or tuning. The CU942B/ARC-54 contains a passive, solid state circuit consisting of a line transformer and reactive matching networks to achieve a voltage standing wave ratio (VSWR) not exceeding 3 to 1 over the frequency range of 30 to 75.95 megacycles.

1-95. Antenna AS-1703/AR

The antenna is a fiberglass whip. The antenna is vertically polarized to provide omnidirectional coverage in the azimuth plane. The radiating element is No. 16 copperweld stranded conductor terminated at the tip by a 50-megohm static suppressor. The nominal input impedance of the antenna (with coupler) is 50 ohms and the antenna

will handle 20 watts of RF power.

1-96. Antenna Couplers CU-942/ARC-54 and CU-943/ARC-54

(fig. 1-35, 6-25, and 6-26)

a. General. Antenna Couplers CU-942/ARC-54 (used for fixed-wing aircraft and some large helicopter installations) and CU-943/ARC-54 (used for small helicopter installations) are identical, except for the values of inductors used at the lower frequencies. This difference is necessary because of the impedance variations caused by various aircraft. Since the aircraft fuselage acts as a reflector for RF energy, the exact shape of the fuselage and the position of the antenna on the fuselage affect the VSWR of the antenna. For this reason, the two couplers are not interchangeable.

b. Circuit Description.

(1) The RF output from the receiver-transmitter unit is coupled into the antenna coupler through J102 to contact 11 of ambiguity switch S102A. From here, the signal is coupled either to the high-band switching circuit through contact 2, or to the low-band switching circuit through contact 12. The switch is positioned by motor B101, as are all switches in the unit. The signal is then coupled through an impedance-matching circuit consisting of a series inductor and a shunt capacitor. The particular inductor and capacitor used depend upon the frequency setting of the radio set. The RF energy is then coupled from the impedance-matching circuit to contact 13 of ambiguity switch S102B (if the radio set is operating in the frequency range of 50.00 to 69.95 megacycles) or contact 3 of ambiguity switch S102B (if the radio set is operating in the frequency range of 30.00 to 49.95 megacycles). From here, the signal is coupled, through contact 16 of S102B, to the antenna. In the receive condition, the signal path is reversed. Figure 1-35 shows a typical matching network for high-band frequencies and a

and couples the received signal into the second transmitter for retransmission.

δ. The relay station may be operated in either carrier squelch or tone squelch mode. (Squelch disable mode cannot be used for retransmit operation.) The radio set transmitter control circuits are interlocked by retransmit control relays to assure that the two radio sets will not transmit simultaneously and that the two radio sets will not oscillate between receive and transmit modes. Figure 1-34 is a simplified block diagram showing the retransmit relays in their deenergized condition (both radio sets in receive mode with no signal received).

1-93. Retransmit Operation

(fig. 1-34)

a. Retransmit Circuit, Static Condition. The radio sets are in the static condition when no signals are being received or transmitted and both radio sets are in receive mode.

- (1) *Carrier squelch mode.* In carrier squelch mode, both the receive audio module retransmit relays (K1301) are deenergized because no carrier signal is present in either radio set. (See para. 1-39 for operation of relay K1301.) With these relays deenergized, the carrier retransmit ground return paths for the PTT (push-to-talk) buses are open, thus both transmitters are deactivated.
- (2) *Tone squelch mode.* In tone squelch mode, both the receive audio module retransmit relays (K1301) are energized during the absence of a tone signal. With these relays energized, the tone retransmit ground return paths for the PTT buses are open, thus both transmitters are deactivated.

b. Retransmit Circuit, Dynamic Condition. In the following discussion consider that radio set No. 1 first receives a signal.

- (1) *Carrier squelch mode.* When a signal is received by radio set No. 1, the noise level in the radio set decreases because of squelch action. The decrease in noise level operates the audio gate in the receive audio module, allowing retransmit switch

Q1307, in radio set No. 1 receive audio module, to conduct, thereby energizing relay K1301. With K1301 energized, the carrier retransmit groundpath is completed allowing the ground, which originates in the transmit audio module, to be applied through the closed contacts of K1301, and then through the control units to the PTT bus of radio set No. 2. At the same time, the received signal is coupled from radio set No. 1 through the control units to the transmit circuits of radio set No. 2. The ground, placed on radio set No. 2 PTT bus, simultaneously keys the transmitter and energizes K1401. Since amplifier Q1307, in the receive audio module of radio set No. 2, is operated by the squelching of noise in the radio set (para. 1-39a), relay K1301 energizes during the presence of a transmitted carrier just as it does with a received carrier. To prevent this action from completing a groundpath that would energize the transmit circuits of radio set No. 1, the path is broken by the operation of relay K1401 in the transmit audio module (radio set No. 2). (Relay K1401 operated immediately upon application of the PTT ground, while the operation of K1301 was slightly delayed because of the time required for squelching.) Relay K1401 remains energized for a short time after the termination or interruption of the receiver signal. (See para. 1-15 for details of relay interlock circuit operation.) This delay is necessary because of the time required for receiver squelching. If K1401 were allowed to deenergize rapidly at the end of the receive-transmit cycle, relay K1301 (radio set No. 2), which can deenergize only after the radio set is squelched, would provide a completed path that would place radio set No. 1 in transmit mode. Radio set No. 1 would transmit a carrier until K1301 finally deenergized, at which time K1401 in radio set No. 1 would provide a ground back to radio set No. 2. The result would be that the two radio sets would con-

tinue to transmit carriers back and forth to each other effectively disabling the relay station.

- (2) *Tone squelch mode.* Retransmit operation in tone squelch mode is the same as in carrier squelch mode except that the retransmit groundpath is completed

when relay K1301 is deenergized instead of when K1301 is energized. Relay K1301 is energized in the static (no signal) condition and will deenergize when a tone signal is present. (See para. 1-39b for operation of K1301 in tone squelch mode.)

Section IX. FUNCTIONING OF ANTENNA AS-1703/AR AND ANTENNA COUPLERS CU-942/ARC-54 AND CU-943/ARC-54

1-94. General

The communications antenna system for Radio Set AN/ARC-54 consists of a whip antenna (Antenna AS-1703/AR) and an impedance-matching coupler (Coupler, Antenna CU-942/ARC-54 or CU-943/ARC-54). The antenna and coupler are both mounted to the external surface of the aircraft. (The coupler is housed in a streamlined fiberglass housing.) The coupler provides impedance matching between the antenna and the receiver-transmitter unit for all channels within the frequency range of the radio set (30.00 to 69.95 megacycles). The antenna coupler contains impedance-matching circuits which are selected by rotary switches driven by an electric motor. The motor is part of a seeking switch circuit similar to the autopositioner circuit in the receiver-transmitter unit. The antenna coupler has one impedance-matching circuit for each whole-megacycle setting of the radio set. The impedance-matching circuits maintain a voltage standing wave ratio (vswr) of 2 to 1 from 40 to 70 megacycles and 3 to 1 from 30 to 40 megacycles.

1-95. Antenna AS-1703/AR

The antenna is a fiberglass whip. The antenna is vertically polarized to provide omnidirectional coverage in the azimuth plane. The radiating element is No. 16 copperweld stranded conductor terminated at the tip by a 50-megohm static suppressor. The nominal input impedance of the antenna (with coupler) is 50 ohms and the antenna will handle 20 watts of RF power.

1-96. Antenna Couplers CU-942/ARC-54 and CU-943/ARC-54

(figs. 1-35, 6-25, and 6-26)

a. General. Antenna Couplers CU-942/ARC-54 (used for fixed-wing aircraft and some large

helicopter installations) and CU-943/ARC-54 (used for small helicopter installations) are identical, except for the values of inductors used at the lower frequencies. This difference is necessary because of the impedance variations caused by various aircraft. Since the aircraft fuselage acts as a reflector for RF energy, the exact shape of the fuselage and the position of the antenna on the fuselage affect the vswr of the antenna. For this reason, the two couplers are not interchangeable.

b. Circuit Description.

- (1) The RF output from the receiver-transmitter unit is coupled into the antenna coupler through J102 to contact 11 of ambiguity switch S102A. From here, the signal is coupled either to the high-band switching circuit through contact 2, or to the low-band switching circuit through contact 12. The switch is positioned by motor B101, as are all switches in the unit. The signal is then coupled through an impedance-matching circuit consisting of a series inductor and a shunt capacitor. The particular inductor and capacitor used depend upon the frequency setting of the radio set. The RF energy is then coupled from the impedance-matching circuit to contact 13 of ambiguity switch S102B (if the radio set is operating in the frequency range of 50.00 to 69.95 megacycles) or contact 3 of ambiguity switch S102B (if the radio set is operating in the frequency range of 30.00 to 49.95 megacycles). From here, the signal is coupled, through contact 16 of S102B, to the antenna. In the receive condition, the signal path is reversed. Figure 1-35 shows a typical matching network for high-band frequencies and a

typical matching network for low-band frequencies.

- (2) Motor B101 is part of a seeking switch circuit similar to the autopositioner circuit in the receiver-transmitter unit. When the control unit megacycle selector is switched from one frequency to another, a ground is placed on one of the control wires that comes into the antenna coupler through J101. This ground is applied, through contact 14, 15, 16, 17, or 18 of open-seeking switch S103A, to contact 12, the ground is connected to relay K101, energizing the relay, which in turn, applies power from pin J of J101 to motor B101. The motor drives all the switches, through a gear train, until the antenna coupler is tuned to the correct position. When the antenna coupler is tuned to the correct position, the ground to relay K101 is removed by S103A. Relay K101 deenergizes, removing the motor ground and shorting the motor armature, thereby stopping the motor. Diodes CR101 and CR102 prevent the grounds from being coupled back to the receiver-transmitter unit and causing the radio set to recycle. Capacitor C144 allows fast collapse of the electric field around the motor windings. Capacitor C145 allows fast collapse of the electric field around the relay winding.
- (3) The ambiguity ground at pin G or F of J101 serves the same purpose as the ambiguity ground in the receiver-transmitter unit; that is, it maintains a ground for relay K101 so that motor B101 will continue to drive through positions that would otherwise be selected by ambiguous coding information. For example, refer to the chart in paragraph 1-81 that shows control wire ground coding for the 1-megacycle shaft in the receiver-transmitter unit (the information applies to the antenna coupler as well as the receiver-transmitter unit). This chart shows that the same coding information is supplied for selection of the 60-megacycle position as for selection of the 40-megacycle position. If the radio set is

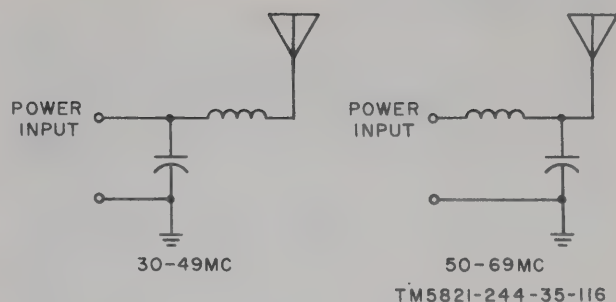


Figure 1-35. Antenna coupler matching network, simplified schematic diagram.

switched from 30 megacycles to 60 megacycles, the motor in the antenna coupler will run until it reaches the 60-megacycle position. In order for this to happen, however, the motor must run through the 40-megacycle position, which uses the same coding as the 60-megacycle position. The ambiguity switch (S102A) maintains a ground for K101 during this ambiguous-frequency crossing so that the motor will not stop at this position. When the antenna coupler reaches the 49-megacycle position, the ambiguity ground is removed by S102A, allowing the motor to stop on the next position that provides the proper code (open circuit). That position will be 60 megacycles. The function of the open-seeking switching system is described in detail in paragraph 1-82c, which describes an identical circuit in the receiver-transmitter.

- (4) For frequency settings of 30.00 to 49.95 megacycles, switch S101A selects the capacitance and S101B selects the inductance to provide the proper impedance matching between the antenna and the receiver-transmitter unit. Capacitance is selected by the connection of one or more of capacitors C120 through C143. Inductance is selected by the connection of one of inductors L121 through L145. The equivalent circuit for any of these selections is shown in figure 1-35. All circuits used in this frequency range (30.00 to 49.95 megacycles) are of the capacitive input configuration. For frequency settings of 50.00 to 69.95 mega-

cycles, switch S103B selects the capacitance and S103C selects the inductance to provide the proper impedance matching between the antenna and the receiver-transmitter unit. Capacitance is selected by the connection of one or more of capacitors C101 through C119. Inductance is selected by the connection of one of inductors L101 through L120. The equivalent circuit for any of these selections is shown in figure 1-35. All circuits in this frequency range (50.00 to 69.95 megacycles) are of the inductive input configuration.

Section X. FUNCTIONING OF CONTROL INDICATOR C-8157/ARC

NOTE

Control Indicator C-8157/ARC is used with, but not part of Radio Set AN/ARC-54.

1-97. General

This section contains detailed description of circuits that comprise Control Indicator C-8157/ARC.

a. The control indicator will be installed in aircraft whenever TSEC/KY-28 is installed, and is used to control the output of Radio Set AN/ARC-54 (or equivalent) as to the mode of operation.

b. Whenever the C-8157/ARC is installed, the output of the radio set will be controlled by Control Indicator C-8157/ARC in either plain or cipher mode.

NOTE

MWO 11-5821-244-30/2, 12 September 1966, must be applied to Radio Set AN/ARC-54 when used with the TSEC/KY-28 and C-8157/ARC for (X) mode operation.

1-98. Power Control CB1

(fig. 1-36)

The power control (CB1) is a circuit breaker which doubles as a POWER ON switch. Circuit breaker CB1 applies +28 volts dc to the control indicator. The +28 volts is supplied from the aircraft +28-volt dc bus through the aircraft harness, connector P1, and pin A of J1. The +28 volts dc through CB1 is applied to pin 2 of PLAIN-CIPHER switch SW1 to POWER ON indicator L1 to ZEROIZE switch SW3 and pin B of J1. Pins E and F of J1 connect from the ground bus of aircraft and are tied to ground along with ground return to TSEC/KY-28. Pin D of J1 connects from system ground to ground, REG—RE-X, Switch SW2 and pin 2 of PLAIN-CIPHER switch.

1-96.1 Differences in Models

Antenna Coupler CU942B/ARC-54 differs from the CU942/ARC-54 and CU943/ARC-54 in the following details.

- The CU942B/ARC-54 is completely solid state and contains only passive circuits.
- No internal switching is employed; therefore, the ten-conductor power cable is not required.
- The CU942B/ARC-54 is one-way interchangeable with the CU942/ARC-54.

NOTES

- Circuit breaker CB1 must be in the ON position to have any output from associated radio equipment.
- External wiring is not part of Control Indicator C-8157/ARC.

1-99. ZEROIZE Switch SW3

(fig. 1-36)

The ZEROIZE switch (SW3) is a two-position locking toggle, under a spring-loaded cover, and is normally in the OFF position. Switch SW3 will be placed in the ON position only during emergency situations. When SW3 is placed in the ON position, +28 volts dc is applied to the TSEC/KY-28 through pin C of J1 and P1 and the aircraft harness wiring.

1-100. PLAIN-CIPHER Switch SW1

(fig. 1-36)

Switch SW1 is used to supply either plain or cipher mode of operation, and is a double-throw, double-pole switch.

a. *Plain Mode.* With switch SW1 in the PLAIN position, pins 1 and 2 of SW1 make contact, causing the red lamp (L2) to light and applies +28 volts dc potential to the receive plain-cipher control of the TSEC/KY-28 through contact J of P1 and J1.

b. *Cipher Mode.* With switch SW1 in the CIPHER position, pins 2 and 3 of SW1 make contact, causing the green lamp (L3) and remote cipher lamp (if used) to light, and applies a ground potential (contacts 3 through 1) to receive plain-cipher control through contact J of P1 and J1.

1-101. REG—RE-X Switch SW2

(fig. 1-36)

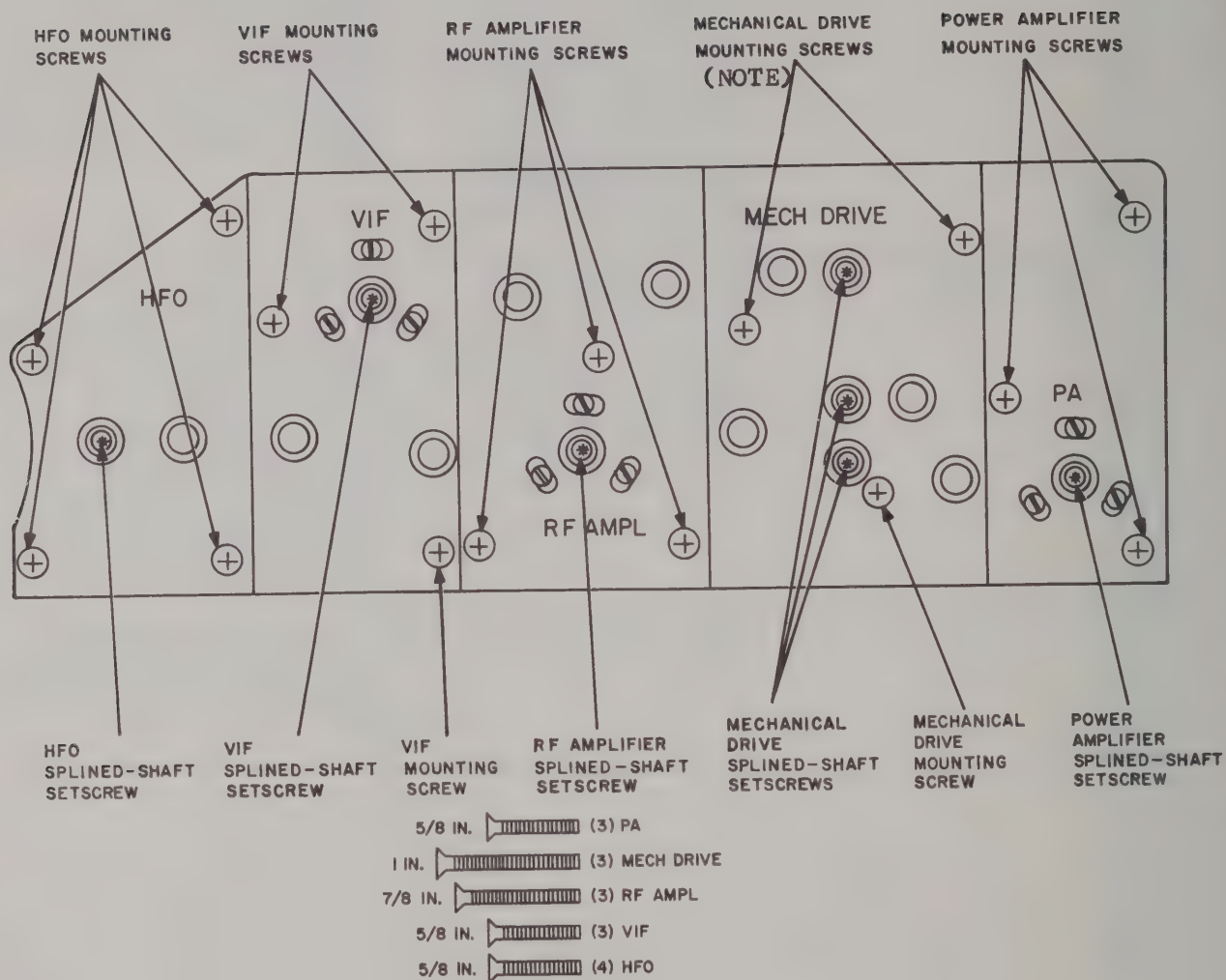
Switch SW2 is a two-position locking toggle switch and is used whenever retransmission is necessary. Switch SW2 is normally in the REG position, which allows either cipher or plain communications.

a. RE-X Position. When switch SW2 is in the

RE-X (closed) position, a ground potential is applied to the KY-28 for extended range, through pin K of J1, P1, and the aircraft's interconnecting harness.

b. REG Position. In this position of switch SW2 (REG), the ground potential supplied to the KY-28 is removed.

Item	Indication	Probable trouble	Procedure
TRANSMITTER—Continued			
29	Weak or no transmission on some frequencies.	If the defective channels are adjacent to each other (all at high, middle, or low end of the band), the trouble is probably improper tracking. If there are one or more defective channels that are scattered (not adjacent), the trouble is probably improper oscillator frequencies (defective crystals or oscillator alignment).	Check for proper oscillator signals (amplitude and frequency) (<i>b</i> above). If oscillator outputs are correct on the affected frequency, check RF and IF signal levels at all module inputs and outputs to localize the trouble to a module (<i>b</i> above). Check alignment of suspected module (paras. 3-11 through 3-21).
30	Transmission fades after several minutes of operation.	Oscillator drift or defective tubes in power amplifier module.	Check power amplifier tubes first. Perform tests given in <i>b</i> above.
31	Transmission is noisy-----	Defective module, loose coaxial connector, improper alignment, poor bonding between modules and their covers, or modules not making good contact with the chassis.	Check to see that coaxial connectors are tight and shields are properly grounded. Check power amplifier tubes. Use an oscilloscope to check all RF and IF signals for excessive noise at module inputs and outputs. Check for improper alignment (paras. 3-16 through 3-21). Substitute modules one at a time until noise is reduced. Check capacitors on RF subchassis, reheating solder joints or replacing capacitors as necessary.
32	Transmission is distorted-----	Improper alignment, or a defective module.	Check the mechanical alignment of all modules (para. 3-16). If alignment is good, replace each module on the RF subchassis until the distortion is eliminated.



NOTE

Effective with sets, Serial Number 750, the mechanical drive mounting screws were changed from 1 inch in length to 7/8 inch in length. When performing maintenance, replace the one inch screws with 7/8 inch mounting screws.

TM5821-244-35-106

Figure 4-1. RF subchassis module removal, gear-train side.

4-21.1 TROUBLESHOOTING OF ANTENNA COUPLER CU-942B/ARC-54

(fig. 4-38.1 and 4-38.2)

a. General. The Antenna Coupler CU-942B/ARC-54 consists of a fiberglass cover which houses the actual circuitry, and the circuitry itself. The broadband matching circuit is passive, solid state, and has no moving or replaceable parts. The circuitry is completely encapsulated in hardened foam making it a non-repairable unit (fig. 4-38.1).

b. Preliminary Procedure. With the coupler installed in the normal operating configuration, connect a Bird Model 43 thru-line wattmeter (or equivalent) as shown in fig. 4-38-2. Key the transmitter at 53 megacycles (midband) and note that the power level indicated on the wattmeter

is 50 watts + (2.5 watts) in the forward direction. Next measure the reverse power and compute the voltage standing wave ratio (VSWR). The VSWR should not exceed 3 to 1. If a higher VSWR is noted, visually check for defective cables and poor electrical connections. If no evidence of damage or contamination is noted, remove the coupler from the rest of the radio set. Next, remove the fiberglass cover and make sure that the RF receptacle which mates with the banana plug in the fiberglass cover is free to move and the braid is not broken. Also check the banana plug itself for signs of corrosion or damage. If no discrepancies are noted during the above checks, but the VSWR was not within specifications, the coupler should be replaced.

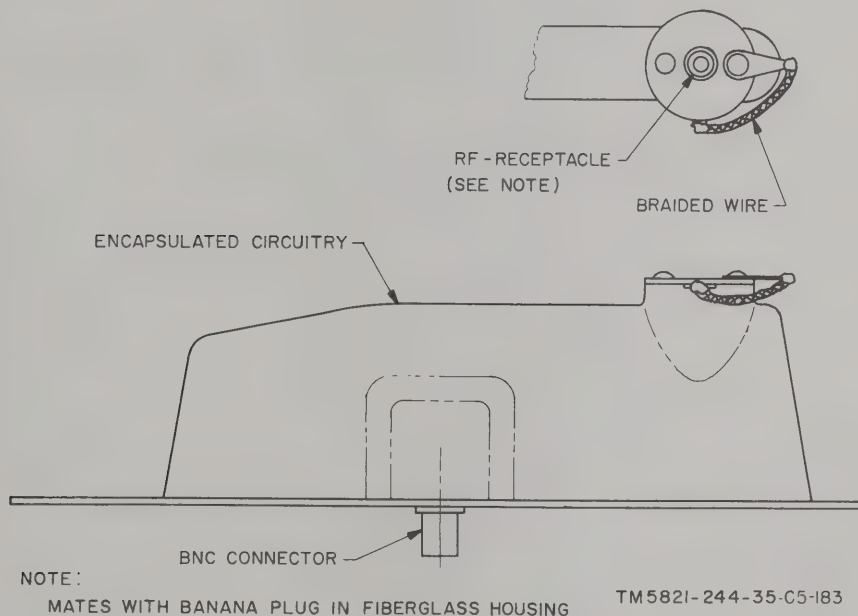
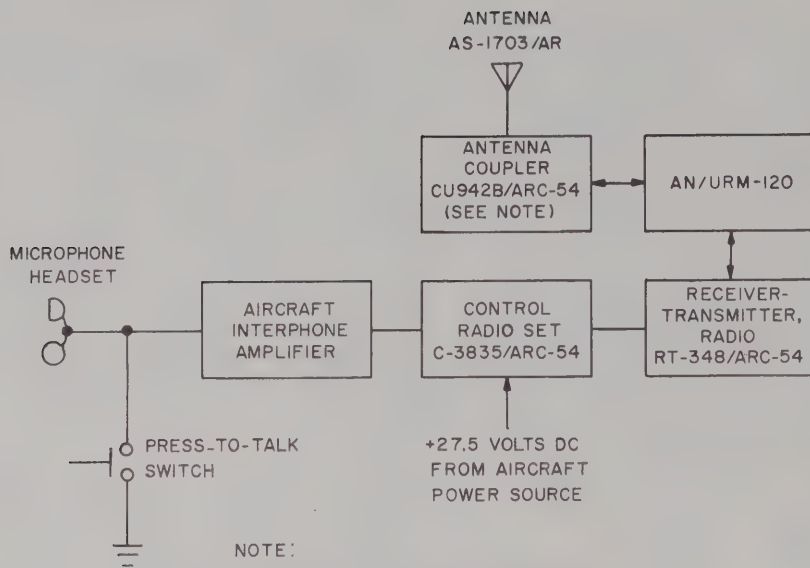


Figure 4-38.1 Antenna coupler, parts identification, right side.



NOTE:

THIS TEST SETUP APPLIES ONLY TO
THE CU-942B/ARC-54 COUPLER.

TM5821-244-35-C5-182

Figure 4-38.2 Troubleshooting test setup for Antenna
Coupler CU-942B/ARC-54.

CHANGE

24 NOV 1969

No. 4

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 8 July 1969

DS, GS, and Depot Maintenance Manual

RADIO SET AN/ARC-54 AND CONTROL INDICATOR C-8157/ARC

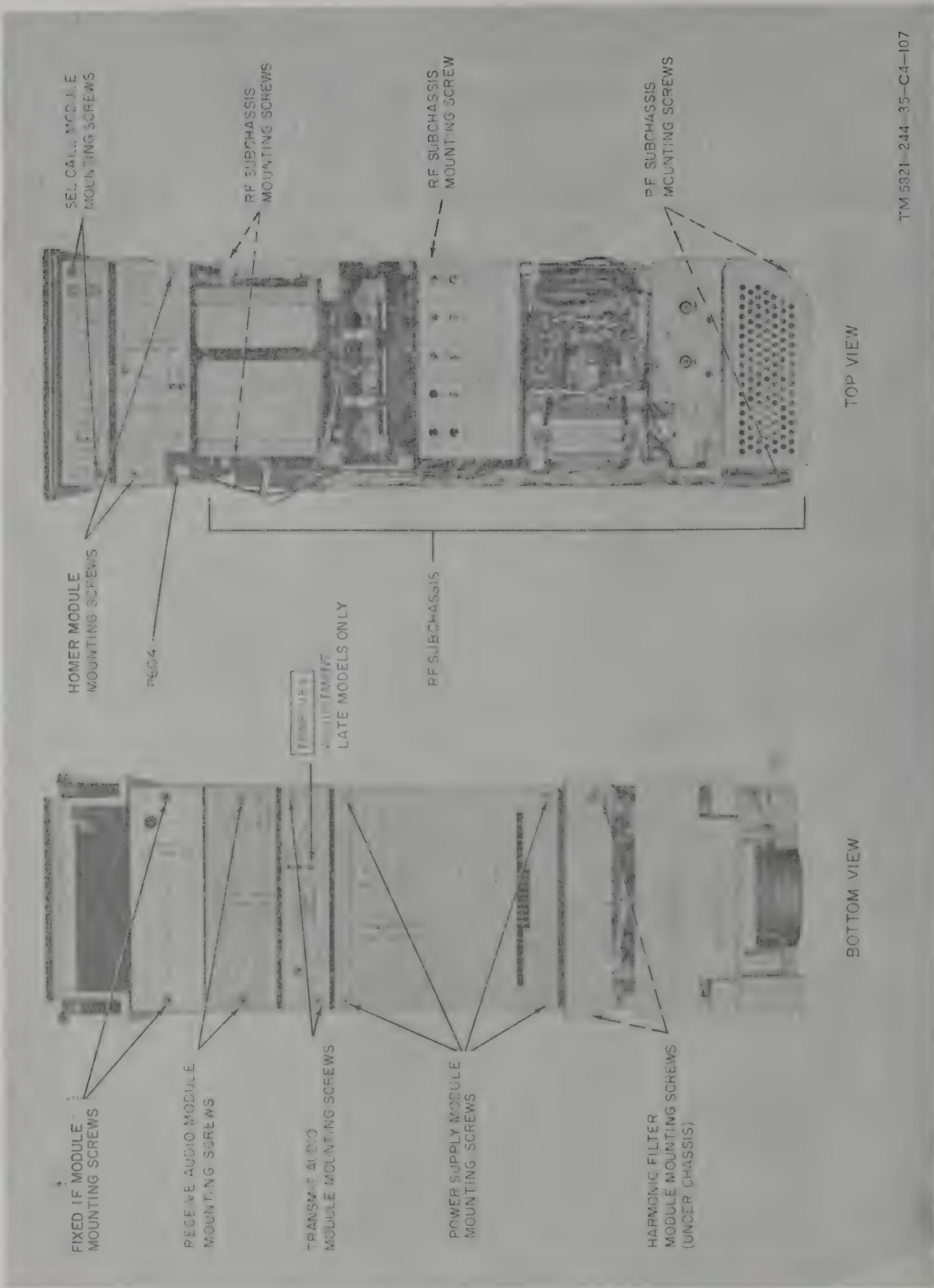
TM 11-5821-244-35, 17 November 1965 is changed as follows:

Remove old pages and insert new pages as indicated below.

<i>Remove pages—</i>	<i>Insert pages—</i>
1-5 through 1-10	1-5 through 1-9
1-13 through 1-22	1-13 through 1-22
1-27 through 1-32	1-27 through 1-132
1-35 and 1-36	1-35 and 1-36
1-41 through 1-48	1-41 through 1-48
1-73 and 1-74	1-73 and 1-74
2-21 through 2-24	2-21 through 2-24
2-27 and 2-28	2-27 and 2-28
2-33 and 2-34	2-33 and 2-34
3-3 and 3-4	3-3 and 3-4.1
3-11 through 3-14	3-11, 3-12, 3-12.1, 3-13 and 3-14
4-1 through 4-8	4-1 through 4-8
4-15 and 4-16	4-15, 4-16
4-19 and 4-20	4-19 and 4-20
4-33 through 4-38	4-33 through 4-38
4-43 and 4-44	4-43 and 4-44.1
4-47 through 4-52	4-47 through 4-52
4-55 through 4-60	4-55 through 4-60.1
4-63 and 4-64	4-63 and 4-64
4-73 and 4-74	4-73 and 4-74
4-79 and 4-80	4-79 and 4-80
4-85 and 4-86	4-85 through 4-88
4-91 and 4-92	4-91 and 4-92
4-97 through 4-102	4-97 through 4-102
5-1 through 5-42	5-1 through 5-67
Figure 6-2	6-5 and 6-6
Figure 6-5	6-11 and 6-12
Figure 6-6	6-13 and 6-14
Figure 6-9	6-19 and 6-20
Figure 6-11	6-25 and 6-26
Figure 6-14	6-31 and 6-32
Figure 6-17	6-37 and 6-38
Figure 6-18	6-39 and 6-40
Figure 6-21	6-43 and 6-44
Figure 6-22	6-45 and 6-46
Figure 6-25	6-51 and 6-52
Figure 6-26	6-53 and 6-54
Figure 6-27	6-55 and 6-56
Figure 6-28	6-57 and 6-58
Figure 6-29	6-59 and 6-60
Figure 6-30	6-61 and 6-62
Figure 6-31	6-63 and 6-64

File this change sheet in the front of the manual for reference purposes.

Item	Indication	Probable trouble	Procedure
MISCELLANEOUS—Continued			
56	Faulty or no homing operation	Homer module, fixed IF module, or chassis wiring.	Check for continuity between pin 16 of main chassis connector P1005 and pin 8 of J1003 (mates with homer module). If continuity is present, replace homer module. If problem still exists, replace fixed if. module.
57	Faulty or no security operation	Fixed if module or chassis wiring.	Check fixed if. module by substitution. If this does not correct trouble, check chassis wiring (fig. 6-30).
58	Radio fails to operate in RETRAN mode (retransmit installation only).	Receive audio module, transmit audio module, or chassis wiring. <i>Note.</i> Since retransmit operation depends on squelch action, any squelch troubles could cause retransmit troubles. Check receiver-transmitter for normal squelch operation.	If receiver-transmitters retransmit normally in one direction (radio No. 1 will receive and radio No. 2 will retransmit), but not in opposite direction, check, by substitution, receive audio module and transmit audio module of radio that transmits properly. If replacement of receive audio and transmit audio modules fails to correct fault, and both radios work properly when operated individually, check chassis wiring (fig. 6-30).
59	Radio oscillates in retransmit operation.	Receive audio module, transmit audio module, or squelch adjustment.	Check, and adjust as necessary, both receiver-transmitter SQ ADJ potentiometers (para. 2-12). If adjustments do not correct fault, check receive audio and transmit audio modules by substitution.
60	Retransmit operation is normal in CARR but not in TONE squelch (or vice versa).	Squelch. (See items 33-35.)	Check each receiver-transmitter individually. Check for squelch troubles in accordance with items in 33-35 above.
61	Receiver-transmitter locks in transmit (or receive) mode when operated in retransmit mode.	Receive audio module, transmit audio module, or relay K1001.	Check by substitution.



TM 5821-244-35-C4-107

Figure 2-5. Receiver-transmitter, component identification.

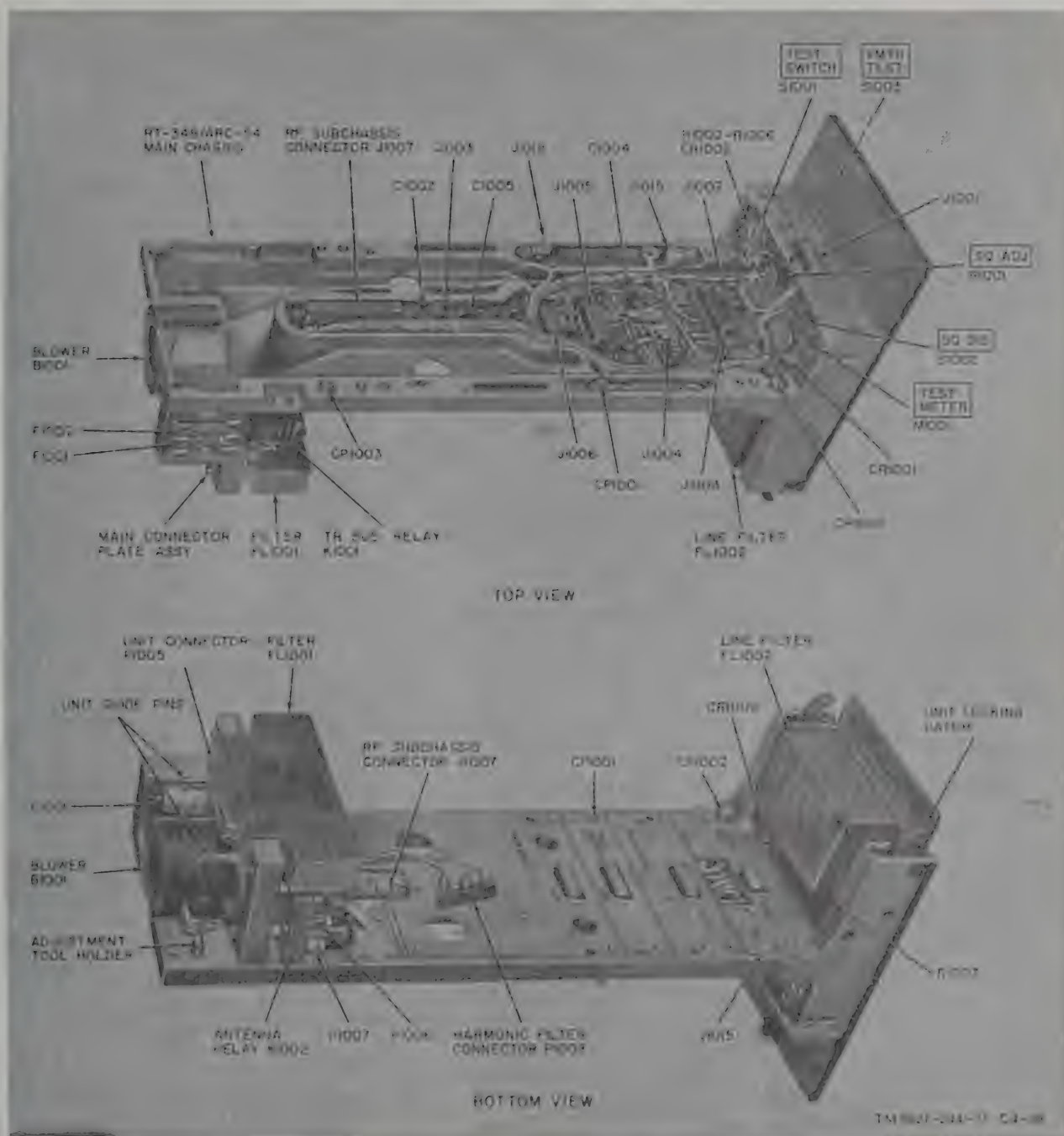
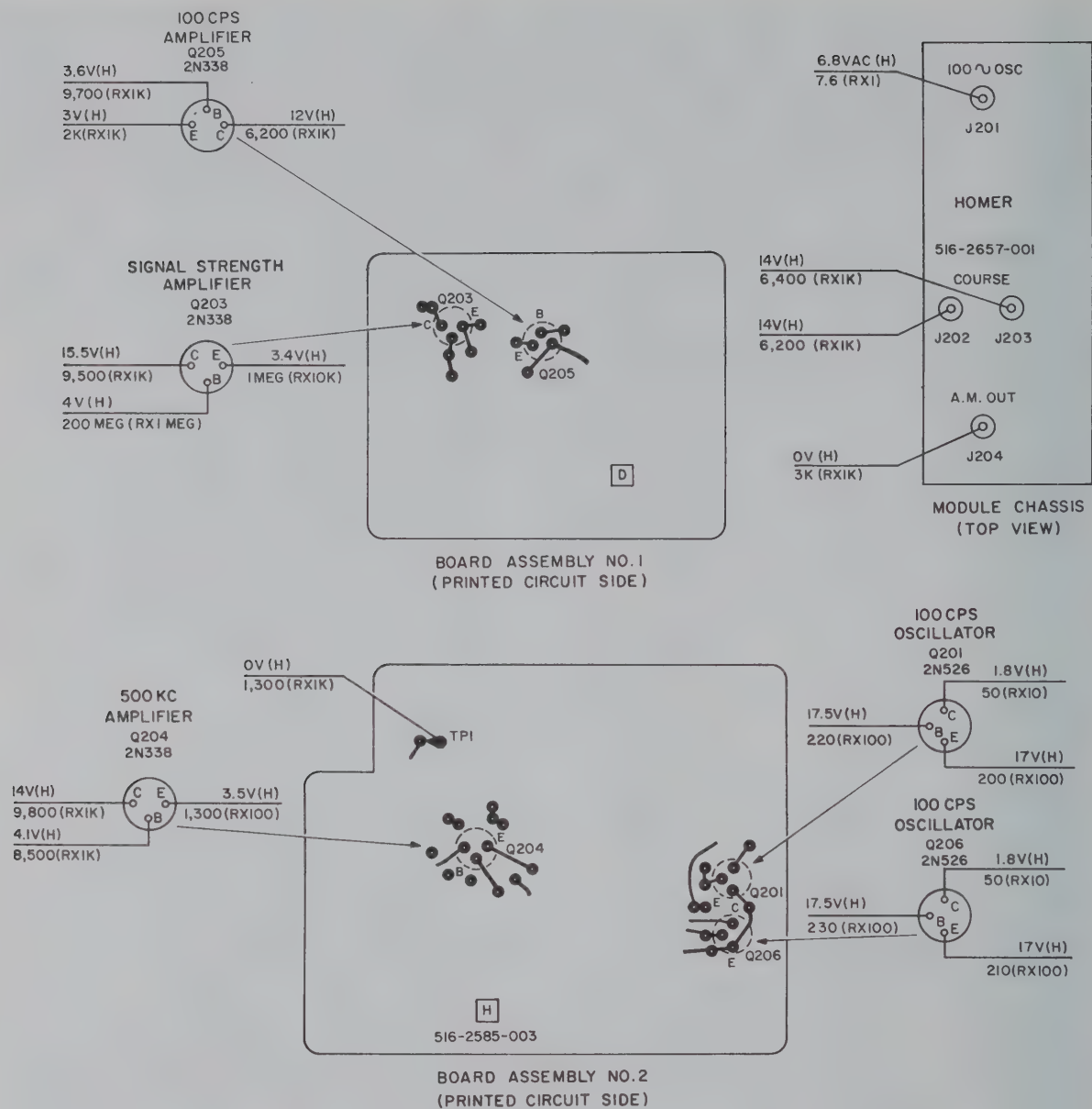


Figure 2-6. Receiver-transmitter main chassis, parts identification.

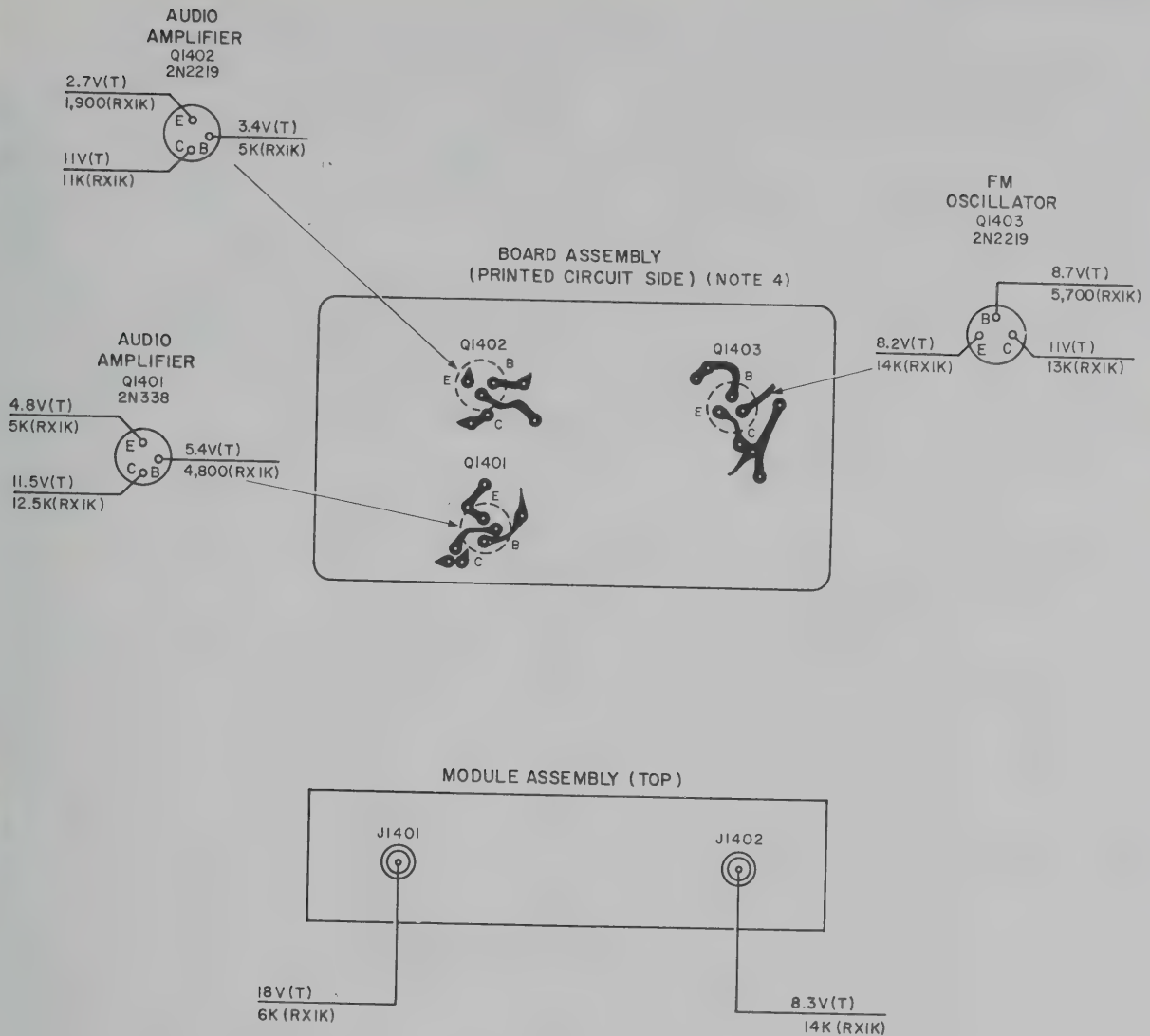


NOTES

- ALL MEASUREMENTS WERE MADE IN-CIRCUIT WITH MULTIMETER ME-26/U. VOLTAGES ARE +DC WITH RESPECT TO CHASSIS GROUND UNLESS OTHERWISE NOTED. MEASUREMENTS ARE TYPICAL.
- (R) INDICATES RECEIVE MODE, (T) INDICATES TRANSMIT MODE, (H) INDICATES HOME MODE.
- RESISTANCE MEASUREMENTS WERE MADE WITH COMMON METER LEAD TO GROUND AND MODULE REMOVED FROM THE UNIT (NO POWER APPLIED) NUMBERS IN PARENTHESES INDICATE METER SCALE USED.
- VOLTAGES MEASURED WITH AGC INPUT OF 4.0VDC AND INDICATOR (ID-48/ARN) CONNECTED.

TM5821-244-35-99

Figure 2-7. Homer module, voltage and resistance diagram.



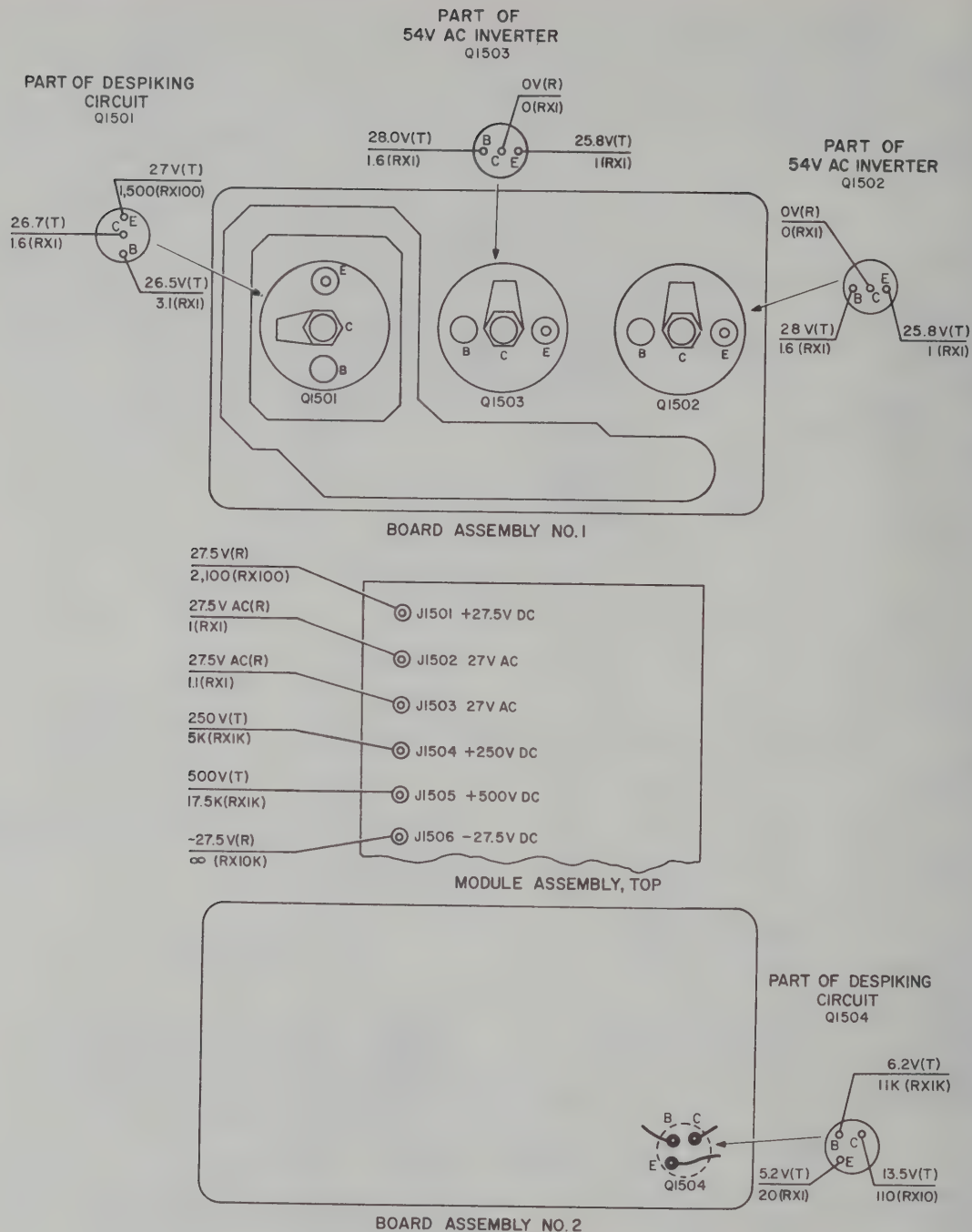
NOTES

1. ALL MEASUREMENTS WERE MADE IN-CIRCUIT WITH MULTIMETER ME-26/U VOLTAGES ARE +DC WITH RESPECT TO CHASSIS GROUND UNLESS OTHERWISE NOTED. MEASUREMENTS ARE TYPICAL.
2. (R) INDICATES RECEIVE MODE, (T) INDICATES TRANSMIT MODE, (H) INDICATES HOME MODE.

3. RESISTANCE MEASUREMENTS WERE MADE WITH COMMON METER LEAD TO GROUND AND MODULE REMOVED FROM THE UNIT (NO POWER APPLIED) NUMBERS IN PARENTHESES INDICATE METER SCALE USED.
4. TYPICAL BOARD SHOWN

TM5821-244-35-C4-95

Figure 2-10. Transmit audio module, voltage and resistance diagram.



NOTES

1. ALL MEASUREMENTS WERE MADE IN-CIRCUIT WITH MULTIMETER ME-26/U. VOLTAGES ARE +DC WITH RESPECT TO CHASSIS GROUND UNLESS OTHERWISE NOTED. MEASUREMENTS ARE TYPICAL.
2. (R) INDICATES RECEIVE MODE, (T) INDICATES TRANSMIT MODE, (H) INDICATES HOME MODE.
3. RESISTANCE MEASUREMENTS WERE MADE WITH COMMON METER LEAD TO GROUND AND MODULE REMOVED FROM THE UNIT (NO POWER APPLIED) NUMBERS IN PARENTHESES INDICATE METER SCALE USED.

TM5821-244-35-98

Figure 2-11. Power supply module, voltage and resistance diagram.

2-15. Control Unit Operational Checkout

If the trouble symptoms are not known, perform the following operational checkout by the use of the MK-733/ARC-54 and a multimeter. When the trouble symptom is known, perform the checks given in the troubleshooting chart (para. 2-16).

a. Control Unit Test Setup (fig. 2-13).

- (1) Connect the control unit to J16 on the test set by the use of the CX-9071/ARC-54 cable provided as part of the maintenance kit.
- (2) Connect a +27.5-volt power supply to J32 on the test set.
- (3) Use a multimeter to take measurements at test set test jacks as prescribed in the operational checkout procedure (b below).

b. Operational Checkout Procedure.

- (1) Set test set controls S6 to XMIT, S10 to SIM, S11 to CONT UNIT, S12 to RADIO, and the power switch to OFF.
- (2) Set simulator controls S1 to OFF, S2 to ON, and S3 to OFF.
- (3) Set the control unit mode control to PTT.
- (4) Using the multimeter, check for direct continuity between J18 and J31 on the test set. If continuity does not exist, check the control unit PTT line. (See item 1 of the troubleshooting chart.)
- (5) Set test set control S6 to RCV.
- (6) Check for direct continuity between J24 and J25 on the test set. If continuity does not exist, check the control unit transmit audio (hi) line. (See item 2 of the troubleshooting chart.)
- (7) Check for direct continuity between J21 and J31 on the test set. If continuity does not exist, check the control unit transmit audio output (lo) line. (See item 3 of the troubleshooting chart.)
- (8) Check the resistance between J28 and J31 on the test set. The resistance should be approximately 162 ohms. If the resistance is low, the control unit volume (VOL) control (R101) or resistor R104 is faulty. If continuity does not exist, check the control unit receive audio (hi)

line. (See item 4 of the troubleshooting chart.)

- (9) Check the resistance between J30 and J31 on the test set while varying the volume (VOL) control setting on the control unit. The resistance should vary smoothly from 12 to 162 ohms. If the resistance variation is not smooth or does not reach the limits specified, the volume (VOL) control (R101) is faulty. If continuity does not exist, check the receive audio line in the control unit. (See item 5 of the troubleshooting chart.)
- (10) Set the control unit mode control to PTT and the SQUELCH control to CARR. Set the test set power switch to ON. Observe that the simulator CARR lamp lights. If the lamp fails to light, check the control unit carrier squelch control line. (See item 6 of the troubleshooting chart.)
- (11) Set the control unit SQUELCH control to TONE and observe that the simulator TONE lamp lights. If the lamp fails to light, check the control unit tone squelch control line. (See item 7 of the troubleshooting chart.)
- (12) Set the control unit SQUELCH control to DIS and observe that the simulator CARR and SEC lamps light. If the lamps fail to light, check the control unit squelch disable ground line. (See item 8 of the troubleshooting chart.)
- (13) Set the mode control on the control unit to RETRAN. Check for direct continuity between J26 and J29 on the test set. If continuity does not exist, check the control unit retransmit audio (lo, receive) line. (See item 9 of the troubleshooting chart.)
- (14) Set test set control S6 to XMIT and the test set power switch to OFF.
- (15) Check for direct continuity between J22 and J31 on the test set. If continuity does not exist, check the control unit retransmit control ground (transmit) line. (See item 10 of the troubleshooting chart.)

- (16) Set test set control S6 to RCV and simulator control S1 to RETRAN CARR. Set the control unit SQUELCH control to CARR.
- (17) Check for direct continuity between J17 and J31 on the test set. If continuity does not exist, check the control unit carrier retransmit control ground (receive) circuit. (See item 11 of the troubleshooting chart.)
- (18) Set simulator control S1 to RETRAN TONE and the control unit SQUELCH control to TONE (if that position is not disabled).
- (19) Check for direct continuity between J28 and J19 on the test set. If continuity does not exist, check the retransmit audio (hi, receive) line in the control unit. (See item 12 of the troubleshooting chart.)
- (20) Check for direct continuity between J26 and J31 on the test set. If continuity does not exist, check the retransmit audio (lo, receive) line in the control unit. (See item 13 of the troubleshooting chart.)
- (21) Check for direct continuity between J23 and J31 on the test set. If continuity does not exist, check the retransmit audio (lo, transmit) line in the control unit. (See item 14 of the troubleshooting chart.)
- (22) Check the resistance between J20 and J24 on the test set. The resistance should be approximately 330 ohms. If the resistance is high or low, check control unit resistor R103. If an open circuit is indicated, check the retransmit audio (hi, transmit) line in the control unit. (See item 15 of the troubleshooting chart.)
- (23) Set simulator control S1 to OFF. Set the test set power switch to ON. Set the control unit mode control to PTT and the frequency controls to 30.00 megacycles. Note that the simulator FREQUENCY counter indicates 30.00 megacycles. If correct frequency is not displayed, see item 16 of the troubleshooting chart.
- (24) Successively select each whole-megacycle frequency on the control unit while observing the simulator FREQUENCY counter and ODD MC and EVEN MC lamps. The counter should agree with the control unit frequency settings and the ODD MC or EVEN MC lamps should light when an odd or even frequency is selected. If either lamp fails to light on the proper frequencies, or lights on the wrong frequencies, check the control unit off- or even-megacycle control line. (See item 17 of the troubleshooting chart.) If the frequency counter does not agree with the control unit setting on all frequencies, check the control unit megacycle control lines. (See item 16 of the troubleshooting chart.)
- (25) Set test set control S12 to ANT COUPLER and repeat the procedure given in (24) above. If the counter fails to agree with the control unit setting on all frequencies, check the control unit antenna coupler control lines. (See item 18 of the troubleshooting chart.)
- (26) Set test set control S6 to XMIT, and S12 to RADIO. Repeat the procedure given in (24) above; note, in addition, that the simulator HAR FIL lamp lights for all frequency settings from 30 through 45 megacycles, and does not light for all frequencies above 46 megacycles. If the lamps do not operate properly, check the control unit harmonic filter relay control line. (See item 19 of the troubleshooting chart.)
- (27) Set test set control S6 to RCV. Beginning with the control unit .05-megacycle control set for .00 megacycles, successively select each .05-megacycle setting and observe the simulator FREQUENCY counter. The counter should agree with the control unit setting for each frequency setting. If the counters do not agree, check the control unit .05-megacycle control lines. (See item 20 of the troubleshooting chart.)
- (28) Set test set control S1 to RETRANSMIT CARRIER, and set the control unit mode control to HOME and the SQUELCH control to CARR. Observe the flags on the test set homing indicator (ID-48/ARN) and the simulator HOME lamp. When the control unit mode control is set to HOME, the flags on the homing indicator should

- (1) Place the module in position on the main chassis and press down so that coaxial connector P1601 engages main chassis coaxial receptacle CP1003.
- (2) Connect coaxial connector P1602 (connector has red boot) to the antenna relay coaxial receptacle marked with a red dot (receptacle farthest from the main chassis).
- (3) Connect main chassis connector P1008 to module connector J1601.
- (4) Secure the module to the main chassis with the four screws.

3-4. RF Power Amplifier Module Tube Replacement

The RF power amplifier module is the only module containing electron tubes and is the only module to be repaired at the direct support level. Direct support repair of the RF power amplifier is confined to tube replacement. No special procedures are required for tube replacement. All three power amplifier tubes are accessible from the top of the module after removing the perforated cover.

3-5. Receiver-Transmitter Chassis-Mounted Parts

(fig. 3-1)

Step-by-step instructions for removal and replacement of receiver-transmitter parts that are mounted to the main chassis are given below. Figure 3-1 shows all chassis-mounted parts exploded from a stripped chassis (all modules removed); in many cases, removal of all modules is not necessary. Remove only enough modules to reach the part. (Refer to para. 3-2 for cover removal and para. 3-3 for module removal.)

a. Removal of TEST METER (M1001). To remove the TEST METER, unsolder and tag the wires behind the meter (2, fig. 3-1), unscrew the meter-holding nut (4, fig. 3-1), and remove the meter through the front of the unit. Save the O-ring (3, fig. 3-1) and packing material (if used) if the same meter is to be reinstalled.

b. Replacement of TEST METER (M1001). To replace the TEST METER, insert the meter through the front of the unit (replacing preformed packing if used) and secure with the

O-ring and the meter-holding nut (3 and 4, fig. 3-1). Solder the wires to terminals behind the meter.

c. Removal of TEST SWITCH (S1001). To remove the TEST SWITCH (5, fig. 3-1), set the switch to position 12, unsolder and tag all wires behind the switch, remove the screw, lockwasher, flat washer, knob, and hexagonal nut (6 through 10 respectively), and remove the switch through the rear of the unit.

d. Replacement of TEST SWITCH (S1001). To replace the TEST SWITCH, place the switch in the proper hole in the unit so that the locating key fits in the locating hole and secure with the switch hexagonal nut (10, fig. 3-1). Mount the knob (9) so that it is in position 12. (The switch is in position 12 when the rotor tab is in contact with the long stator contact.) Secure the knob with a $\frac{5}{16}$ -inch x 2-56 PPH screw, a No. 2 lockwasher, and a No. 2 flat washer (6, 7, and 8).

e. Removal of Blower (B1001). To remove the blower (35, fig. 3-1), remove the two screws (36) from the synchro mounts (37) and pull the blower out from the rear of the unit. Unsolder and tag the three wires and remove the blower.

f. Replacement of Blower (B1001). To replace the blower (35, fig. 3-1), solder the three wires to the three terminals; then place the blower in position so that the lettering on the blower is visible and the wires are not taut. Secure the blower to the unit with two synchro mounts (37) and screws (36).

g. Removal of Line Filter (FL1001). To remove the line filter (39, fig. 3-1), disconnect main chassis connector P1001 (not shown) from the filter, remove the four 4-40 x $\frac{1}{4}$ -inch Phillips panhead screws and No. 4 lockwashers (40 and 41) and remove the filter. Disconnect the three RF cables and remove the ground strap.

h. Replacement of Line Filter (FL1001). To replace the line filter (39, fig. 3-1), place the filter in position so that the two guide pins face the rear and top of the unit (as shown in fig. 3-1) and connect main chassis connector P1001 and the three RF cables and ground strap to the filter. Secure the filter to the unit with four 4-40 x $\frac{1}{4}$ -inch Phillips panhead screws and four No. 4 lockwashers (40 and 41).

i. Removal of Antenna Relay (K1002). To remove the antenna relay (49, fig. 3-1), discon-

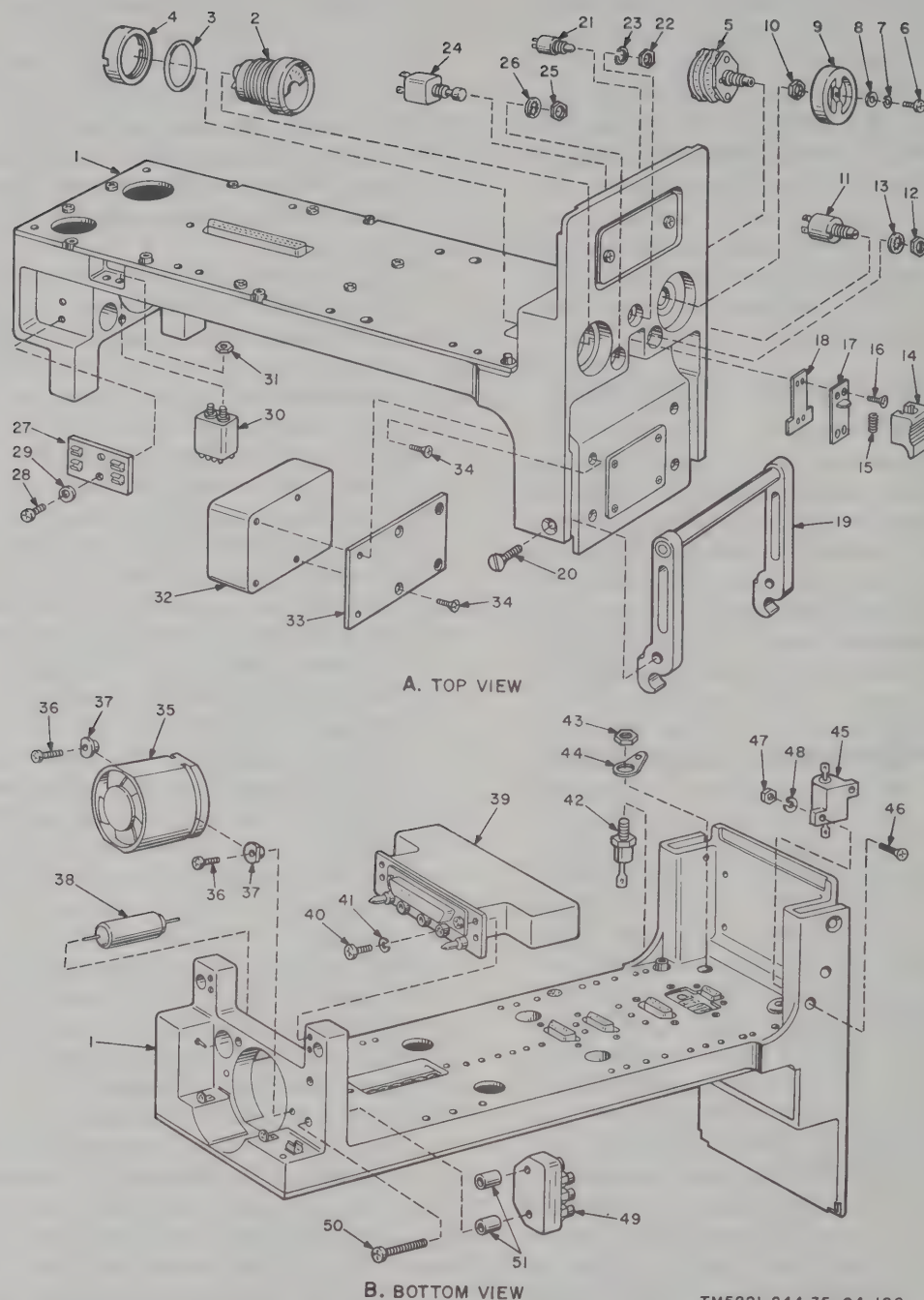


Figure 3-1. Receiver-transmitter main chassis, exploded view.

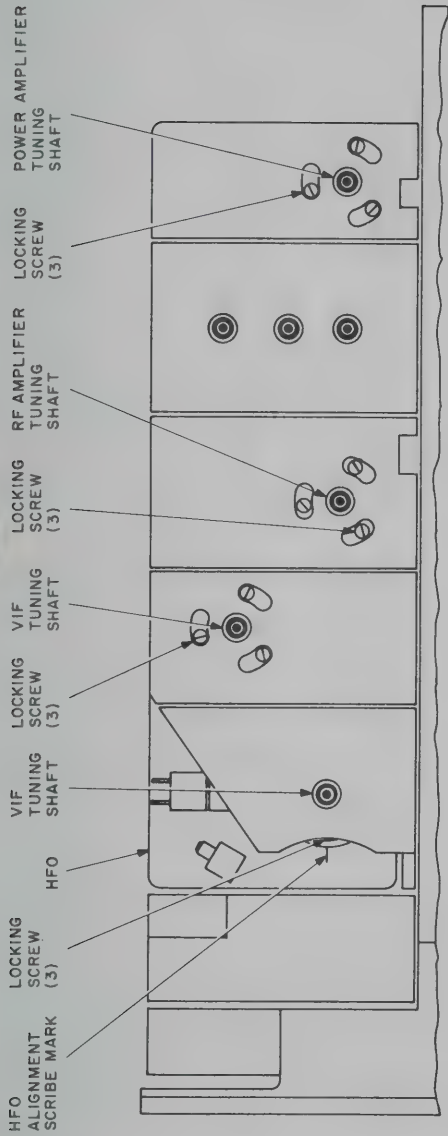
nect the three coaxial connectors (two coaxial connectors if the harmonic filter module has been removed) from the relay; unsolder and tag the two wires that connect to the relay (side toward center of unit); and remove the

two 6-32 x 1 1/8-inch Phillips panhead screws and spacers (50 and 51).

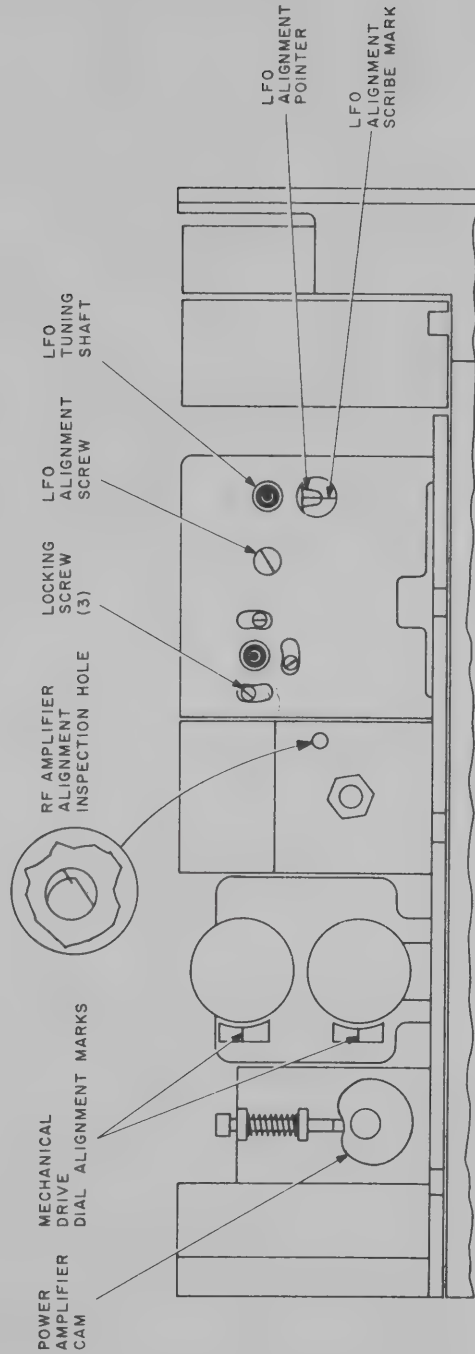
j. *Replacement of Antenna Relay (K1002).* To replace the antenna relay (49, fig. 3-1),

place the relay in position as shown in figure 3-1 and connect the three coaxial connectors (two coaxial connectors if the harmonic filter module is removed) to the relay. (Note the color coding on the connectors and the relay.)

Solder the two wires to the relay. Secure the relay to the unit with two 6-32 x 1 $\frac{1}{8}$ -inch Phillips panhead screws and spacers (50 and 51).



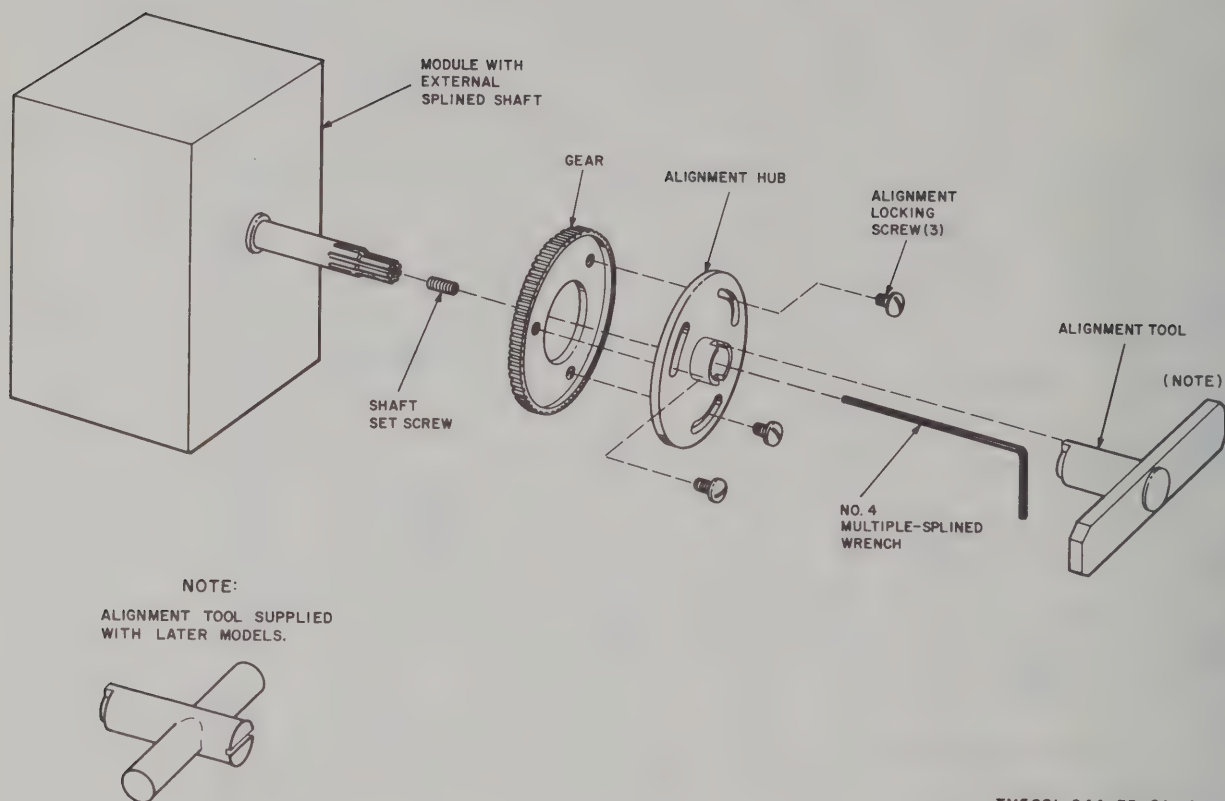
A. RIGHT SIDE



B. LEFT SIDE

Figure 3-2. RF subchassis, mechanical alignment.

TM5821-244-35-118



TM5821-244-35-C4-104

Figure 3-3. Mechanical drive module, alignment and locking.

train and the variable IF module is aligned as instructed in *c* above.

(2) Loosen the three low frequency oscillator alignment locking screws (fig. 3-2).

(3) Using a common slot screwdriver, rotate the low frequency oscillator alignment screw (fig. 6-7) until the module pointer (detail B, fig. 6-7) aligns with the scribe mark on the module chassis.

(4) Tighten the alignment locking screws.

e. RF Amplifier Module. Align the RF Amplifier module tuning shaft as follows:

(1) Make sure that the module is properly secured to the RF subchassis.

(2) Loosen the three module alignment screws (fig. 3-2).

(3) Using the alignment tool (stowed at the rear of the receiver-transmitter main chassis) as shown in figure 3-3, rotate the RF amplifier tuning shaft until the scribe mark on the end rotor plate of the module variable capacitor aligns with the edge of the end stator plate (detail A, fig. 6-7).

(4) Tighten the alignment locking screws.

f. RF Power Amplifier Module. The power amplifier module slug rack is spring loaded to the 30-megacycle position. To insure proper shaft position after installation, loosen the

three module alignment locking screws (fig. 3-2) to allow the spring-loaded rack to drive to the correct position; then tighten the screws.

3-17. High-Frequency Oscillator Alignment (fig. 3-4)

To align the high frequency oscillator module, use the module tester and an RF subchassis and proceed as follows:

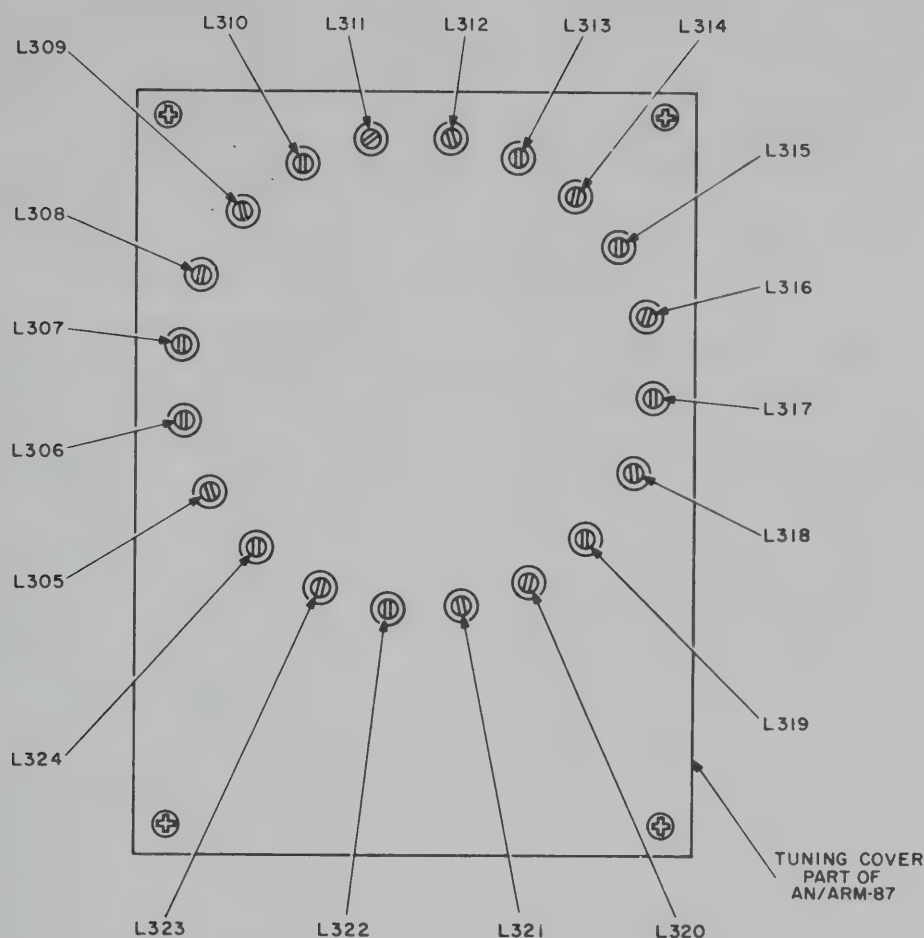
a. Remove the variable IF module and the low frequency oscillator module (to reach the high frequency oscillator module). Leave the high frequency oscillator output cable connected to J301 (connects to the RF amplifier module).

b. Remove the cover from the high frequency oscillator module and install the tuning cover. (The cover is identical with the regular cover except that holes have been provided for access to the module tuning slugs. The cover is provided as a part of the module tester.)

c. Set the CIRCUIT SELECTOR switches on the module tester for program 1X4X (X means any position).

d. Set the FREQUENCY SELECTOR-MC switches on the module tester for 30 megacycles.

e. Using a nonmetallic tuning rod, tune L305 (fig. 3-4) for maximum indication on the module tester meter (hold the PRESS TO TEST button down for reading).



TM 5821-244-35-127

Figure 3-4. High-frequency oscillator module, alignment test points.

f. Set the FREQUENCY SELECTOR-MC switches to 32, 34, 36, etc. (every even megacycle), tuning each coil (going clockwise from L305) for maximum. Tune L306 at 32 mc, L307 at 34 mc, etc.

g. Beginning at 30 megacycles, repeat the above procedure and secure the slugs with *coil dope*.

3-18. Low-Frequency Oscillator Module Alignment

Align the low-frequency oscillator module as follows:

a. Remove the variable IF module and the low-frequency oscillator module from the RF subchassis.

b. Remove the low-frequency oscillator module from the variable IF module gear train. Remove the cover from the low-frequency oscillator module.

c. Connect an RF cable to the low-frequency oscillator module coaxial receptacle. (The cable should be the minimum length necessary to reach the module tester.)

d. Reinstall the low-frequency oscillator module in the gear train on the variable IF module, and reinstall the entire assembly in the RF subchassis. Leave the cover off the low-frequency oscillator module.

e. Perform the mechanical alignment as necessary (para. 3-16).

f. Connect the free end of the RF cable to RF VM2 on the module tester.

g. Set the CIRCUIT SELECTOR switches on the module tester for program 05XX.

h. Set the .05 mc FREQUENCY SELECTOR-MC switch to each of its 20 positions and note the TEST METER indication on each position (hold PRESS TO TEST button down for readings). Adjust C401 (fig. 4-19) as necessary to keep all readings above 35 percent.

3-19. Variable IF Module Alignment

(figs. 3-5, 3-6, 3-7, and 3-8)

Electrical alignment procedures for the variable IF module require access to test points located on the bottom of the module. Because the module must be installed in the RF subchassis for accurate tuning shaft positioning, it is necessary to reach the test points with the module installed. The test points can be made accessible by various means such as a shaft-extension fixture to extend the module away from the RF subchassis, a right-angle drive fixture to turn the module sideways while driving it from the gear train, a two-position shaft-positioning fixture (not driven by the gear train), and an RF subchassis with holes in the bottom. The RF subchassis is the most practical and the most accurate and is, therefore, recommended. The RF subchassis modification is given in *a* below. The modification does not adversely affect the serviceability of the RF subchassis and may be performed on any unit as the need arises. The alignment procedure is given in *b* below, and the tracking test, which should be run after alignment if tracking troubles are suspected, is given in *c* below.

a. RF Subchassis Modification and Cable Fabrication. To modify the RF subchassis for variable IF alignment, remove the variable IF module and drill five $\frac{3}{8}$ -inch diameter holes in the bottom of the RF subchassis as shown in figure 3-7. After making sure that the RF subchassis is clean (no pieces of aluminum left over from drilling), install the variable IF module in the subchassis. Fabricate one 2-foot extender cable, two 2-foot RF cables, and one 2½-foot RF cable (fig. 3-6).

b. Alignment Procedure. Align the variable IF module as follows:

Caution: Disconnect the RF power amplifier module and the low-frequency oscillator module main power connectors before applying power to the RF subchassis. Do not, under any circumstances, connect the RF power amplifier connector during the tests, because there is no forced air supply and no RF load connected.

- (1) Perform the variable IF module mechanical alignment (para. 3-16*c*) if necessary.
- (2) Connect the RF subchassis to the TS-2061/ARM-87 as shown in figure 3-5.
- (3) Check to see that the RF power amplifier and low-frequency oscillator main power connectors are disconnected. (Cover the connectors to prevent them from shorting to the chassis.) Apply 115 volts ac primary power to the TS-2061/ARM-87.
- (4) Set the module tester POWER SELECTOR to NORMAL, the FREQUENCY SELECTOR-MC switches to 30-0-.00 and the CIRCUIT SELECTOR switches to X-X-8-9.
- (5) With the 2½-foot RF cable connected to the 3MC jack on the module tester and to J502 on the variable IF module, adjust the module tester LOW FREQ AMPL for a reading of 10 millivolts at J502 (rear of printed-circuit board) as measured on the electronic voltmeter.
- (6) Short TP2 (fig. 3-8) to the chassis and adjust L501 (fig. 3-8) for maximum signal at TP1 as measured with the electronic voltmeter.
- (7) Move the ground from TP2 to TP3 and just L503 for maximum signal at TP1.
- (8) Remove the ground from TP3 and adjust L503 for maximum signal at TP1.
- (9) Short TP5 to chassis and adjust L504 for maximum signal at TP4.
- (10) Move the ground from TP5 to TP6 and adjust L505 for minimum signal at TP4.
- (11) Remove the ground from TP6 and adjust L506 for maximum signal at TP4.
- (12) Adjust L501 and L504 for maximum signal at J503. (Leave the RF amplifier cable connected to J503 and measure at the rear of the printed-circuit board.)
- (13) Move the 2½-foot RF cable from the 3MC jack to the 5-mc jack and set

CHAPTER 4

GENERAL SUPPORT AND DEPOT MAINTENANCE

Section I. TROUBLESHOOTING

4-1. General Maintenance Information

This chapter covers all maintenance of Radio Set AN/ARC-54 that is performed at general support or depot level except alignment procedures, which are covered in paragraphs 3-14 through 3-21. Direct support maintenance (paras. 2-1 through 2-17 and paras. 3-1 through 3-21) includes sectionalization of trouble to a defective unit, removal and replacement of units, localization of troubles within units to a faulty chassis-mounted part or plug-in modules, and removal and replacement of chassis-mounted parts and plug-in modules. The RF subchassis is not maintained by direct support personnel. General support and depot maintenance (paras. 4-1 through 4-38) begins at the module level and includes localization of troubles within modules to a stage and isolation within the stage to a faulty part. General and depot maintenance also includes localization of RF subchassis troubles to a faulty submodule or chassis part and isolation of trouble within submodules. All module repairs are performed at general support or depot level. The antenna coupler is also maintained at general support or depot level. Procedures are provided in this section for troubleshooting the RF subchassis (para. 4-2), the RF submodules (paras. 4-3 through 4-9), the main chassis modules (paras. 4-10 through 4-17), and the antenna coupler (para. 4-21). The troubleshooting charts are keyed to trouble symptoms as observed by the operator. Module performance tests are provided (following each troubleshooting chart) to determine whether the module operates satisfactorily after repair. The tests are also useful for determining the operating condition of any doubtful module. This chapter also includes supplementary troubleshooting data such as voltage and resistance diagrams, dc resistance of coils and trans-

formers, signal substitution checks, stage gain measurements, and parts identification illustrations. These data are referenced in the troubleshooting charts when particularly applicable. Keep in mind, however, that the charts are guides to aid in making a start. Use the supplementary data to understand equipment troubles. Do not rely completely on the charts; reference to the theory in paragraphs 1-1 through 1-95 is essential for efficient troubleshooting of the radio set.

4-2. RF Subchassis Troubleshooting

(figs. 4-1 and 4-2)

a. Test Equipment Required. The following test equipment is required for the troubleshooting procedures given in paragraphs 4-2 through 4-22.

b. RF Subchassis Operational Tests. The following operational tests provide a quick check of RF subchassis performance. The procedure is divided into checks of the performance of each module. Steps 8 and 11 (receive gain and transmit gain, respectively) check the overall performance of the RF subchassis. These tests, except for oscillator frequency tests, require no test equipment except the module tester (AN/ARM-87) and can be performed in a relatively short time. Unless previous checks have resulted in reference to a particular module, perform these tests before using the troubleshooting chart. Since the tests indicate individual module performance as well as overall performance, the tests will be useful for localization of the trouble to a module. Use the troubleshooting chart (*c* below) for further troubleshooting if these tests do not provide conclusive evidence as to the faulty module. Perform the tests again after repairing the module to insure that the trouble no longer exists and that no new troubles have appeared. Figures 4-1 and 6-7 show module removal. Figure 4-2 shows RF

subchassis chassis-mounted parts. Use the AN/ARM-87 to perform the tests below.

Notes:

1. In cases where checks suggested in the chart fail to localize the trouble, suspect the chassis wiring and RF

cables and connections. Refer to figure 6-8 for chassis wiring checks. Make all resistance measurements with power off.

2. X in the CIRCUIT SELECTOR switches column indicates that any setting is satisfactory.

Test equipment	Technical manual	Common name
Test Set, Electronic Circuit Plug-In Unit AN/ARM-87-----	TM 11-6625-467-12-----	Module tester.
Radio Interference Measuring Set AN/URM-85-----	TM 11-6625-351-12-----	
Signal Generator AN/URM-48-----	TM 11-1257-----	Fm signal generator.
Signal Generator AN/USM-44A-----	TM 11-6625-508-10-----	RF signal generator.
Oscilloscope AN/USM-81 with AM-3174A/USM-----	TM 11-6625-219-12-----	Oscilloscope.
Maintenance Kit, Electronic Equipment MK-733/ARC-54-----	TM 11-6625-601-12-----	Maintenance kit.
Admittance Meter, General Radio Model 1602B-----		
Audio Oscillator TS-382/U-----	TM 11-2684-----	Audio oscillator.
Voltmeter, Electronic AN/URM-145-----	TM 11-6625-524-14-----	RF voltmeter.
Frequency Meter AN/USM-26-----	TM 11-5057-----	Frequency meter.
Electronic Voltmeter ME-30B/U-----	TM 11-6625-320-12-----	Electronic voltmeter.
Multimeter ME-26A/U-----	TM 11-6625-200-12-----	Multimeter.

Step	Test name	Circuit selector switches				Instructions	Test limits (percent)															
		A	B	C	D		Min	Max														
1	Lfo RF amplitude-----	0	5	X	X	(1) Connect RF jumper cable W1 from RF VM2 to RF output cable from J401 (LFO module). (2) Set FREQUENCY SELECTOR-MC switches to 30.00. (3) Depress PRESS TO TEST button and read TEST METER. (4) Repeat (2) and (3) above for frequency settings of 30.05 to 30.95 in 0.05 increments. (5) Remove RF jumper cable connected in (1) above.	10	50														
2	Lfo dc to meter-----	1	X	5	X	(1) Set FREQUENCY SELECTOR-MC switches to 30. (2) Depress PRESS TO TEST button and read TEST METER. (3) Repeat steps (1) and (2) above for frequency settings of 30.05 to 30.95 in 0.05 increments.	17	80														
3	Lfo frequency checks----	0	5	X	X	Connect an RF cable between J401 on the module and the AN/USM-26 and measure the oscillator output frequency. Set FREQUENCY SELECTOR-MC switches on module tester to each 0.05 megacycle and check the frequency at each setting. The frequencies should be as follows: <table><tr><th>Setting (mc)</th><th>Reading (kc)</th></tr><tr><td>0.00-----</td><td>4,475±0.470</td></tr><tr><td>.05-----</td><td>4,525±0.470</td></tr><tr><td>.10-----</td><td>4,575±0.470</td></tr><tr><td>.15-----</td><td>4,625±0.470</td></tr><tr><td>.20-----</td><td>4,675±0.470</td></tr><tr><td>.25-----</td><td>4,725±0.470</td></tr></table>	Setting (mc)	Reading (kc)	0.00-----	4,475±0.470	.05-----	4,525±0.470	.10-----	4,575±0.470	.15-----	4,625±0.470	.20-----	4,675±0.470	.25-----	4,725±0.470	NA	NA
Setting (mc)	Reading (kc)																					
0.00-----	4,475±0.470																					
.05-----	4,525±0.470																					
.10-----	4,575±0.470																					
.15-----	4,625±0.470																					
.20-----	4,675±0.470																					
.25-----	4,725±0.470																					

Step	Test name	Circuit selector switches				Instructions	Test limits (percent)	
		A	B	C	D		Min	Max
						<i>Setting (mc)</i> <i>Reading (kc)</i> 0.30----- 4,775±0.470 .35----- 4,825±0.470 .40----- 4,875±0.470 .45----- 4,925±0.470 .50----- 4,975±0.470 .55----- 5,025±0.470 .60----- 5,075±0.470 .65----- 5,125±0.470 .70----- 5,175±0.470 .75----- 5,225±0.470 .80----- 5,275±0.470 .85----- 5,325±0.470 .90----- 5,375±0.470 .95----- 5,425±0.470		
4	Hfo RF amplitude-----	0	5	X	X	Remove test cable and reconnect LFO cable (1) Disconnect cable attached to J301 on hfo module. (2) Connect RF jumper cable W4 from RF VM3 to J301 (hfo module) (3) Set FREQUENCY SELECTOR-MC switches to 30. (4) Depress PRESS TO TEST button and read TEST METER. (5) Repeat (3) and (4) above for all even megacycle frequencies (for example: 32, 34, etc.). (6) Remove the RF jumper cable from RF VM3 and J301 (hfo module). Replace cable removed from J301 in (1) above.	8	60
5	Hfo dc to meter-----	1	X	4	X	(1) Set FREQUENCY SELECTOR-MC switches to 30. (2) Depress PRESS TO TEST button and read TEST METER. (3) Repeat (1) and (2) above for all even megacycle frequencies (for example: 32, 34, etc.).	17	80
6	Hfo frequency checks-----	0	5	X	X	Connect an RF cable from J301 of the module to the AN/USM-26 and measure the oscillator output frequency. Set FREQUENCY SELECTOR-MC switches on the module tester to each even megacycle setting from 30 to 68 megacycles and check the frequency at each setting. The frequencies should be as follows: <i>Setting (mc)</i> <i>Reading (kc)</i> 30----- 26,025±3.2 32----- 28,025±3.2 34----- 30,025±3.2 36----- 32,025±3.2 38----- 34,025±3.2 40----- 36,025±3.2 42----- 38,025±3.2 44----- 40,025±3.2 46----- 42,025±3.2 48----- 44,025±3.2 50----- 46,025±3.2	NA	NA

Step	Test name	Circuit selector switches				Instructions	Test limits (percent)	
		A	B	C	D		Min	Max
7a	Variable IF receive gain (low end)	0	1	8	9	Setting (mc) Reading (kc) 52-----48,025±3.2 54-----50,025±3.2 56-----52,025±3.2 58-----54,025±3.2 60-----56,025±3.2 62-----58,025±3.2 64-----60,025±3.2 66-----62,025±3.2 68-----64,025±3.2	10	70
		6	4	8	9	(1) Depress PRESS TO TEST button and adjust LOW FREQ AMPL control for 50% on TEST METER. (2) Disconnect the cable attached to J502 (variable IF module) and connect RF jumper cable W4 from 3MC jack to J502 (variable IF module). (3) Set FREQUENCY SELECTOR-MC switches to 30. (4) Depress PRESS TO TEST button and read TEST METER.		
7b	Variable IF receive gain (high end).	0	2	9	9	(1) Depress PRESS TO TEST button and adjust LOW FREQ AMPL control for 50% on TEST METER.	10	70
		6	4	9	9	(2) Move RF jumper cable W4 from 3MC jack to 5MC jack. (3) Set FREQUENCY SELECTOR-MC switches to 69.95. (4) Depress PRESS TO TEST button and read TEST METER. (5) Remove RF jumper cable from J502 (variable IF module) and the 5MC jack. Replace cable removed in step 7a(2). (6) Set FREQUENCY SELECTOR-MC switches to 30.00.		
8a	Receive gain (30 mc)-----	0	4	7	3	(1) Connect RF jumper cable W4 from 30MC jack to RF VM1.	17	
		6	5	7	3	(2) Depress the PRESS TO TEST button and adjust HIGH FREQ AMPL for 90% on TEST METER. (3) Remove RF jumper cable W4 from RF VM1 and connect it to one end of 70-db attenuator. (4) Connect other end of 70-db attenuator to P604 (antenna input, RF amplifier module). (5) Set FREQUENCY SELECTOR-MC switches to 30. (6) Depress PRESS TO TEST button and read TEST METER. (7) Remove RF jumper cable W4 from 30MC jack.		

Step	Test name	Circuit selector switches				Instructions	Test limits (percent)	
		A	B	C	D		Min	Max
8b	Receive gain (68 mc)-----	0	5	6	3 (AN/ARM-87 cal)	<i>Setting (mc)</i> (1) Connect RF jumper cable W5 from 68MC jack to RF VM1. (2) Depress PRESS TO TEST button and adjust HIGH FREQ AMPL for 90% on TEST METER. <i>Reading (kc)</i> (3) Remove RF jumper cable W5 from RF VM1 and connect to one end of the 70-db attenuator. (4) Connect the other end of the 70-db attenuator to P604 (antenna input, RF amplifier module). (5) Set FREQUENCY SELECTOR-MC switches to 68. (6) Depress PRESS TO TEST button and read TEST METER. (7) Remove RF jumper W5 and replace 70-db attenuator in its storage area. (8) Set the POWER SELECTOR to HIGH VOLTAGE.	17	
9a	RF amplifier transmit mode (30 mc).	0	1	8	9 (AN/ARM-87 cal)	(1) Depress PRESS TO TEST button and adjust LOW FREQ AMPL for 100% on TEST METER. (2) Disconnect P601 (RF amplifier module) from J503 (variable IF module). (3) Connect RF jumper cable W2 from 3MC jack to P601 (RF amplifier module). (4) Disconnect P801 (power amplifier module) from J602 (RF amplifier module). (5) Connect RF jumper cable W3 from RF VM4 to J602 (RF amplifier module). (6) Set FREQUENCY SELECTOR-MC switches to 30. (7) Depress PRESS TO TEST button and read TEST METER. (8) Disconnect RF jumper cable W2 from 3MC jack. Set the POWER switch to NORMAL.	5	
9b	RF amplifier transmit mode (69.95 mc).	0	2	9	9 (AN/ARM-87 cal)	(1) Depress PRESS TO TEST button and adjust LOW FREQ AMPL for 100% on TEST METER. (2) Connect RF jumper cable W2 from 5MC jack to P601 (RF amplifier module). (3) Set FREQUENCY SELECTOR-MC switches to 69.95. Set POWER switch to HIGH VOLTAGE. (4) Depress PRESS TO TEST button and read TEST METER. (5) Disconnect RF jumper cable W2 from 5MC jack and W3 from RF VM4 and J602 (RF amplifier module). Set POWER switch to NORMAL. (6) Reconnect P801 (power amplifier module) to J602 (RF amplifier module). (7) Reconnect P601 (RF amplifier module) to J503 (variable IF module).	5	

Step	Test name	Circuit selector switches				Instructions	Test limits (percent)	
		A	B	C	D		Min	Max
10a	RF amplifier and power amplifier module (30 mc).	0	1	8	9	(1) Depress PRESS TO TEST button and adjust LOW FREQ AMPL for 100% on TEST METER. (2) Set POWER SELECTOR switch to HIGH VOLTAGE. (3) Disconnect P601 (RF amplifier module) from J503 (variable IF module). (4) Connect RF jumper cable W2 from 3MC jack to P601 (RF amplifier module). (5) Set FREQUENCY SELECTOR-MC switches to 30. (6) Depress PRESS TO TEST button and read TEST METER. (7) Disconnect RF jumper cable W2 from 3MC jack. (8) Set POWER SELECTOR switch to NORMAL.	50	
10b	RF amplifier and power amplifier modules (69.95 mc).	0	2	9	9	(1) Depress PRESS TO TEST button and adjust LOW FREQ AMPL control for 100% on TEST METER. (2) Set POWER SELECTOR switch to HIGH VOLTAGE. (3) Connect RF jumper cable W2 from 5MC jack to P601 (RF amplifier module). (4) Set FREQUENCY SELECTOR-MC switches to 69.95. (5) Depress PRESS TO TEST button and read TEST METER. (6) Disconnect RF jumper cable W2 from 5MC jack and P601 (RF amplifier module). (7) Set POWER SELECTOR switch to NORMAL. (8) Connect P601 (RF amplifier module) to J503 (variable IF module).	50	
11	Transmit gain-----	6	9	9	7	(1) Depress PRESS TO TEST button and adjust 500 KC AMPL for 30% on TEST METER (2) Set POWER SELECTOR switch to HIGH VOLTAGE. (3) Set FREQUENCY SELECTOR-MC switches to 30. (4) Depress PRESS TO TEST button and read TEST METER. (5) Repeat (3) and (4) above for the following frequency settings:	50	
		(AN/ARM-87 cal)				32.05 54.60 34.10 56.65 36.15 58.70 38.20 60.75 40.25 62.80 42.30 64.85 44.35 66.90 46.40 69.95 48.45 64.85 49.25 66.90 52.55 69.95		

Step	Test name	Circuit selector switches				Instructions	Test limits (percent)	
		A	B	C	D		Min	Max
12a	Power amplifier alignment check.	6	9	9	7	(6) Set POWER SELECTOR switch to NORMAL. (1) Depress PRESS TO TEST button and adjust 500 KC AMPL for 30% on TEST METER. (2) Set POWER SELECTOR switch to HIGH VOLTAGE. (3) Set FREQUENCY SELECTOR-MC switches to 30. (4) Depress PRESS TO TEST button and read TEST METER. (5) Repeat (3) and (4) above for the following frequency settings: 40.25 60.75 49.25 69.95 (6) Set POWER SELECTOR switch to NORMAL.	50	
^b 12b	Power amplifier grid current (30 mc).	7	0	9	7	Depress PRESS TO TEST button and adjust L801 and L802 (power amplifier module) for a maximum reading on TEST METER.	15	70
^b 12c	Power amplifier plate current (30 mc).	9	X	9	7	Depress PRESS TO TEST button and adjust L803 (power amplifier module) for a minimum reading on TEST METER.	25	80
^b 12d	Power amplifier grid current (69.95 mc).	7	0	9	7	(1) Set FREQUENCY SELECTOR-MC switches to 69.95. (2) Depress PRESS TO TEST button and adjust C804 and C812 (power amplifier module) for a maximum reading on TEST METER.	15	70
		9	X	2	7	Tune C816 for minimum reading on the TEST METER.	25	80
^b 12e	Power amplifier alignment.	-----				Repeat steps 12a through 12d until no further improvement in the readings can be made.		

^a If reading is not within limits on all specified frequencies, perform steps 12b through 12e.

^b Not required unless the requirements of step 12a are not met.

NA—Not applicable.

c. General Troubleshooting Information. The chart (*d* below) lists trouble indications as the troubles would appear to the organizational repairman, probable causes of the troubles, and procedures for localizing the troubles to a module or chassis part. Use the chart to supplement the operational test procedure provided in *b* above. The troubles are grouped into the following general types: troubles indicated by TEST METER tests, primary power troubles, receiver troubles, tuning troubles, and transmitter troubles. The following illustrations and data are provided and

should be used as an aid in troubleshooting.

- (1) RF subchassis module removal, exploded view (fig. 6-7).
- (2) RF subchassis module removal, gear-train side (fig. 4-1).
- (3) RF subchassis parts identification (fig 4-2).
- (4) RF subchassis wiring diagram (fig. 6-8).
- (5) Receiver-Transmitter, Radio RT-348/ARC-54 wiring diagram (fig. 6-18).
- (6) RF subchassis, mechanical alignment (fig. 3-2).

- (7) Mechanical drive module, alignment and locking (fig. 3-3).
- (8) Double-conversion superheterodyne system, functional block diagram (fig. 1-32).
- (9) Mode of operation control circuits for Radio Set AN/ARC-54 (fig. 6-23).

- (10) Mechanical tuning assembly, schematic diagram (fig. 1-33).
- (11) Power distribution circuits (fig. 6-21).
- (12) Push-to-talk circuits, functional schematic diagram (fig. 6-4).
- (13) Functioning of equipment (paras. 1-1 through 1-96).

d. Troubleshooting Chart.

Item	Indication	Probable trouble	Procedure
TROUBLES INDICATED BY TEST METER CHECKS			
1	Abnormal receiver-transmitter TEST METER reading on position 3 of RT-348/ARC-54 TEST SWITCH.	Low-frequency oscillator module improperly aligned or defective.	Check mechanical alignment of low-frequency oscillator module (para. 3-18). If good, check adjustment of trimmer capacitor C401 in low-frequency oscillator module (para. 3-18). If this fails to correct the fault, replace module (para. 4-24).
2	Abnormal TEST METER reading on position 4 of RT-348/ARC-54 TEST SWITCH.	High-frequency oscillator module improperly aligned or defective.	Check mechanical alignment of high-frequency oscillator module (para. 3-17). If good, check electrical alignment (para. 3-20). If this check fails to correct the fault, replace module (para. 4-24).
3	Abnormal TEST METER reading on position 6 of RT-348/ARC-54 TEST SWITCH.	Defective AGC circuit. Trouble is probably in variable IF module or RF amplifier module (assuming that fixed IF module is good).	Localize trouble (if the RF subchassis is at fault) by substituting good RF amplifier and variable IF modules for the suspected ones (one at a time). Refer to paragraph 4-24 for removal and replacement instructions. If this does not correct the fault, check RF subchassis wiring (fig. 6-8).
4	Abnormal TEST METER reading on positions 8 and 9 of RT-348/ARC-54 TEST SWITCH (all frequencies).	Low (or no) RF output could be caused by improper alignment, or a failure in any of the modules on RF subchassis.	Perform operational tests in b above. Before replacing a module, check module mechanical alignment (para. 3-16). Refer to paragraph 4-24 for module replacement instructions. Remember to align any module that you replace.
5	Abnormal TEST METER reading on position 9 of RT-348/ARC-54 TEST SWITCH (power supply module checks good).	Power amplifier has a defect that is overloading the +500-volt supply, or chassis wiring (500-volt line) is defective.	Unplug power amplifier module connector P903 and check for a short (or low resistance) to chassis pin A. If chassis wiring is satisfactory, check module for a short (or low resistance) to module chassis at pin A of FL801. Replace module if necessary (para. 4-24). If trouble is not chassis wiring or module wiring, check power amplifier tube V803 for internal shorting and replace if necessary (para. 3-4).
6	Abnormal TEST METER reading on position 10 of RT-348/ARC-54 TEST SWITCH.	Same as item 4 or harmonic filter module.	Same as item 4 or harmonic filter module (para. 4-10).
7	Abnormal TEST METER reading on positions 8 and 10 of RT-348/ARC-54 TEST SWITCH on some frequencies.	Same as item 4	Same as item 4.

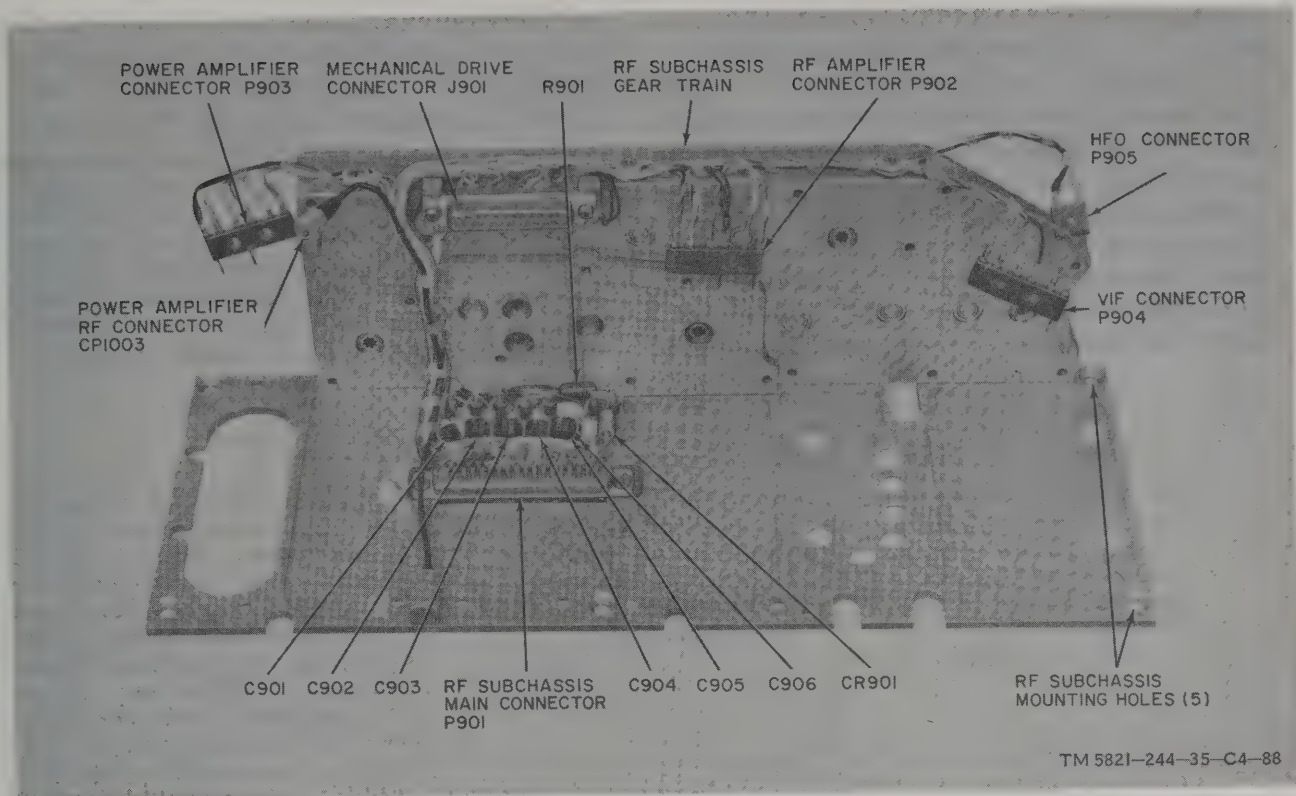


Figure 4-2. RF subchassis, parts identification.

4-3. Power Amplifier Module Troubleshooting

a. General. Use the chart (*c* below) as an aid in localizing and isolating RF amplifier module troubles. If trouble symptoms are not known, perform the tests given in paragraph 4-2*b*, steps 8, 9, and 10. After the trouble is localized to a stage, use the voltage and resistance diagram, dc resistance of coils and transformers table, and module schematic diagram to isolate the trouble to a defective part of connection. These illustrations and other supplementary data are listed below. After repairing the module, install it in the RF subchassis and perform the tests given in paragraph 4-2*b*.

(1) Module alignment (para 3-16*f* mechanical; para. 3-21, electrical).

(2) RF power amplifier module schematic diagram (fig. 1-9).

(3) Circuit functioning (para 1-26).

(4) Module tests (para 4-2*b*, steps 8 through 10).

(5) Power amplifier module, voltage and resistance diagram (fig. 4-5).

(6) Dc resistance of coils and transformers (para 4-18).

(7) Power amplifier module parts identification (figs. 4-3 and 4-4).

(8) General parts replacement instructions (para 4-23).

(9) Mechanical repairs (para 4-26).

(10) RF power amplifier module mechanical assembly, exploded view (fig. 4-43).

b. Troubleshooting Test Setup. Dynamic (power on) troubleshooting of the RF power amplifier module requires the use of a serviceable and properly aligned RF subchassis, a module tester (AN/ARM-87), and associated test equipment (signal generators, oscilloscope, voltmeters, etc.) necessary for the test being performed. Remove the module (para 4-24) and tilt it so that the bottom is accessible (Leave both coaxial cables and the power connector connected.) Remove the bottom cover for access to parts. Make

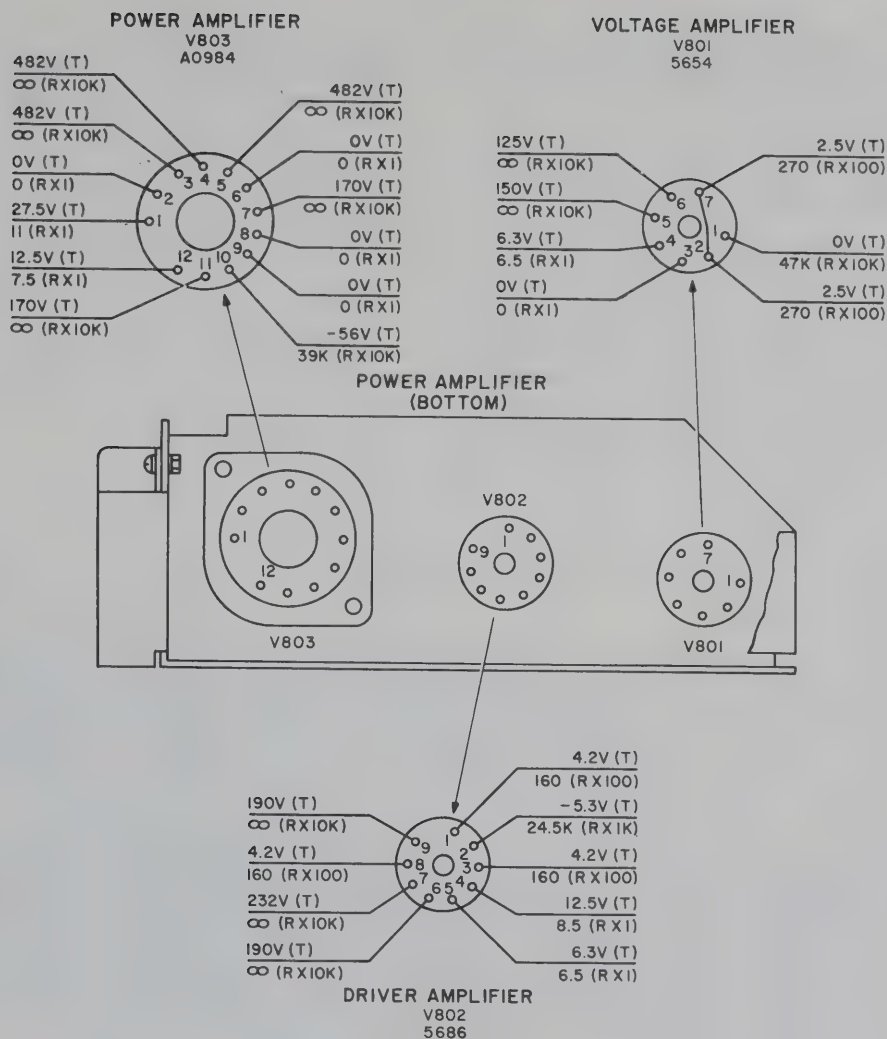
all checks at 30 megacycles (the normal position of the slug rack when removed from gear train).

c. Troubleshooting Chart. The chart below lists common power amplifier troubles, probable causes of the troubles, and suggested procedures for localizing and isolating the troubles. The trouble indications are presented as they would appear to the operator or organizational repairman. Additional indications, recorded during direct support troubleshooting of the receiver-transmitter, should be helpful in providing a start-

ing point for troubleshooting. Supplementary data (*a* above) are referenced in the chart where applicable. Do not rely completely on the chart. Use the supplementary data as much as possible.

Note. RF measurements will not be reliable because of the detuning caused by test probes. Use dc measurements (fig. 4-5) to localize trouble to a stage or circuit. Isolate the trouble within the stage by using a multimeter and the supplementary data listed in *a* above. The tubes were probably checked by the direct support repairman; if necessary, recheck them. Refer to TM 11-6625-467-12 for operating procedures for the module tester.

Item	Indication	Probable trouble	Procedure
1	Low (or no) output from transmitter. Receiver-transmitter TEST METER reads low for positions 8 and 9 (all frequencies).	Defective tube, improper mechanical or electrical alignment, defective coaxial connector, filament circuit, amplifier circuit, filter, or mechanical assembly.	Check tubes by substitution or use tube tester. Check alignment and align if necessary (paras. 3-16f and 3-21). If alignment can be accomplished at one frequency but the module will not track, suspect the mechanical assembly. Refer to paragraph 4-26 for mechanical repair procedures. Check for bent slug rack or for looseness. Check coaxial cable continuity and filament circuit (fig. 1-9). Use the schematic diagram (fig. 1-9), voltage and resistance diagram (fig. 4-5), dc resistance of coil and transformer chart (para. 4-18), and the parts identification illustrations (figs. 4-3 and 4-4) for further troubleshooting.
2	High voltage (+500 or +250 volts) reads low. Abnormal TEST METER readings on position 9 or 10 of receiver-transmitter TEST SWITCH. (Power supply circuit checked good.)	Overload condition caused by internal shorting in tubes or chassis circuit.	Check tubes for internal shorting and check all chassis wiring and circuits associated with high voltages (figs. 1-9 and 4-6).
3	Fuse F1001 blows when power is applied.	Shorted capacitor in filament circuit, shorted wiring, or other overload condition caused by improper bias or defective tube.	Check the resistance from pin C to pin F of FL801. The resistance should be approximately 11 ohms. If less, check for shorted capacitor C821 or C820 and check all filament wiring (fig. 1-9). Make other voltage and resistance checks as necessary to isolate the trouble (fig. 4-5). Check filter FL801 for internal shorting.
4	Fuse F1002 blows when power is applied.	Overload condition in bias circuits or internal short in a tube.	Check the tubes first. Next, isolate the trouble to a stage, insert one tube at a time, and see which one causes the fuse to blow. Caution: Turn off power when removing or replacing tubes. Use the schematic diagram (fig. 1-9) to troubleshoot bias circuits. Refer to figure 4-5 for voltage and resistance measurements and for all tube socket connections.



1 ALL MEASUREMENTS WERE MADE IN-CIRCUIT WITH MULTIMETER ME-26/U. VOLTAGES ARE +DC WITH RESPECT TO CHASSIS GROUND UNLESS OTHERWISE NOTED. MEASUREMENTS ARE TYPICAL.

2. (R) INDICATES RECEIVE MODE, (T) INDICATES TRANSMIT MODE, (H) INDICATES HOME MODE.

NOTES

3 RESISTANCE MEASUREMENTS WERE MADE WITH COMMON METER LEAD TO GROUND AND MODULE REMOVED FROM THE UNIT (NO POWER APPLIED) NUMBERS IN PARENTHESES INDICATE METER SCALE USED

TM5821-244-35-103

Figure 4-5. Power amplifier module, voltage and resistance diagram.

4-4. Mechanical Drive Module Troubleshooting

a. *General.* Use the chart (c below) as an aid in localizing and isolating mechanical drive module troubles. If the condition of the module is unknown, install it in a known good RF subchassis and perform the RF subchassis operational tests (para. 4-2b). Note any tuning problems encountered and refer to the troubleshooting chart for guidance. Do not rely on the troubleshooting

chart to answer all problems. Use the following illustrations and data, which applies to the mechanical drive module, to help in troubleshooting. Refer to the repair procedures (para. 4-27) before attempting to replace parts.

- (1) Module schematic diagram (fig. 6-20).
- (2) Mechanical tuning system, schematic diagram (fig. 1-33).
- (3) Repair procedures (para. 4-27).
- (4) Mechanical drive module, exploded view (fig. 4-44).

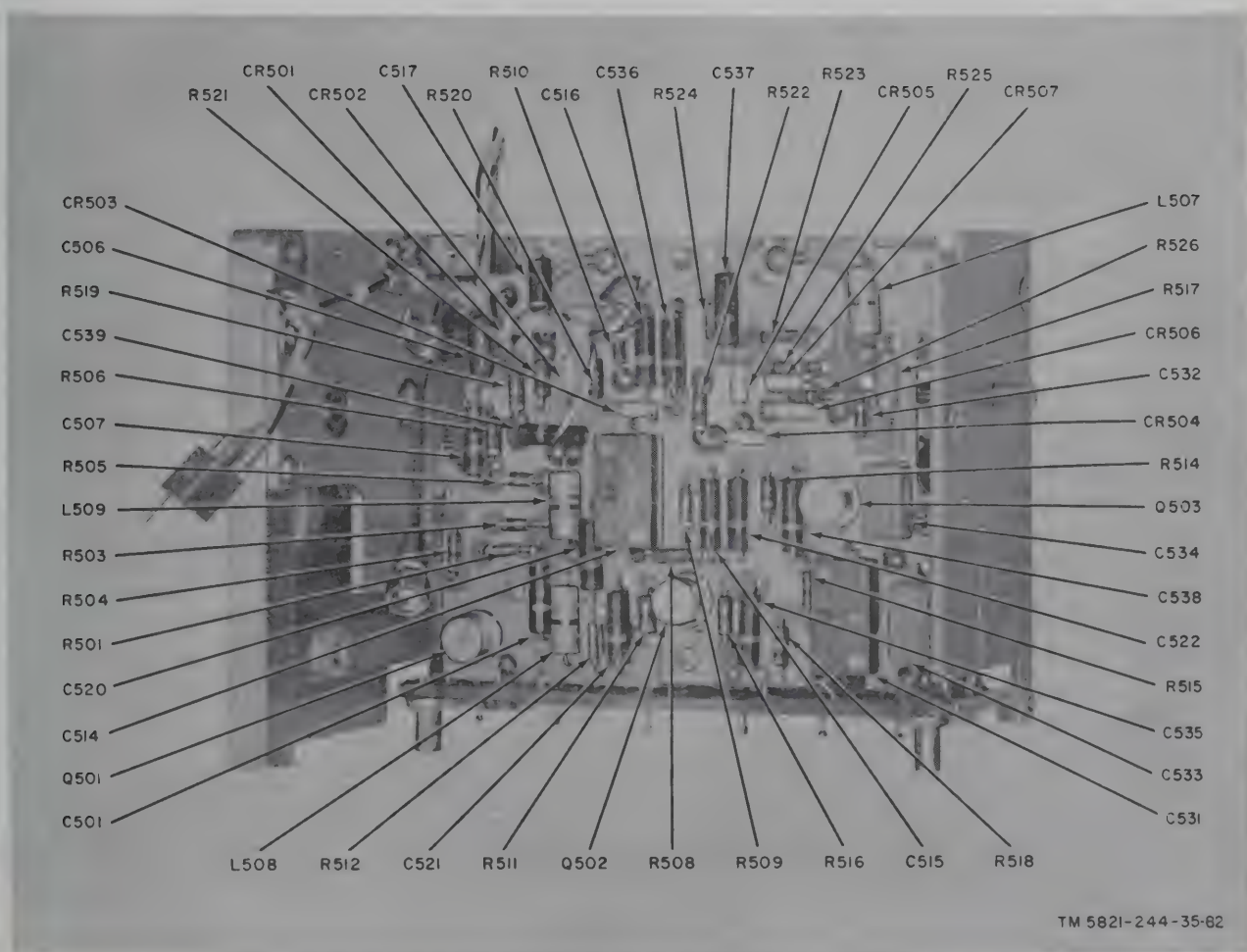
- (5) Parts identification (fig. 4-6).
- (6) Circuit functioning (paras. 1-78 through 1-91).
- (7) Resistance measurements (para. 4-5).
- (8) General parts replacement instruction (electrical parts) (para. 4-23).

b. Troubleshooting Test Setup. The mechanical drive module is essentially mechanical, with switches and relays controlling the mechanical action. Since there are no active circuits (amplifiers, regulators, etc.), signal measurements are not applicable. The only test setup requirement, therefore, is connection of the RF sub-

chassis to the module tester (AN/ARM-87) so that visual observations of mechanical action can be made while the module is operating.

c. Troubleshooting Chart. The chart below lists common mechanical drive module troubles, probable causes, and procedures for localizing and isolating the troubles. The troubles are listed as they are observed by the operator, organizational repairman, or during direct support bench testing of the receiver-transmitter. The majority of troubles that occur in this module can be observed by listening for unusual noises, by observing tuning action visually, or by observing the dials on the side of the module.

Item	Indication	Probable trouble	Procedure
1	Mechanical drive is completely inoperative. Radio set will not change frequencies.	Motor B701, reducer gear assembly, drive assembly, or wiring.	Check for continuity from pin 16 of P701 to motor. If continuity exists, check for continuity through motor primary winding. If motor winding indicates continuity, apply power, select a new frequency, and ground the common motor terminal directly. If the motor operates, check wiring to motor common terminal and check the motor start contacts. If the motor still does not operate, remove the motor from the reducer gear assembly and apply power again. If the motor operates, remove reducer gear assembly, mount motor to reducer gear assembly, and again apply power. If motor drives reducer gear assembly smoothly, drive assembly is at fault.
2	Mechanical drive is partly inoperative (only one frequency dial turns).	Switching circuit, module wiring, or drive assembly defective.	Ground cathode side of diode CR702 (for inoperative mc dial) or K703 (for inoperative 0.05-mc dial). Apply power and check to see whether the inoperative dial will now turn. If dial does not turn, the trouble is in the switch circuit; use the schematic diagram (fig. 6-20) and an ohmmeter to troubleshoot. Refer to paragraph 4-5 for resistance measurements. If trouble still exists, drive assembly or wiring between drive assembly and motor is at fault.
3	Mechanical drive module tunes to wrong frequency.	Switching circuit.....	Use an ohmmeter to check for an open circuit (fig. 6-20 and para. 4-5).
4	Mechanical drive module tunes continuously.	Switching circuit (short to ground); diode CR702 or CR703 shorted, relay K701 or K702 (part of drive assembly) contacts stuck closed.	Check diodes with an ohmmeter. Disconnect common (ground) wire from relay K701 (mc dial rotating) or K702 (0.05-mc dial rotating). If the dial still turns continuously, the relay contacts are shorted internally; replace the drive assembly. If removing the wire stops the dial rotation, look for short circuit in switching circuit (para. 4-5 and fig. 6-20).



TM 5821-244-35-62

Figure 4-13. Variable IF module, parts identification, front view.

- (6) High-frequency oscillator module, voltage and resistance diagram (fig. 4-17).
- (7) Dc resistance of coils and transformers (para. 4-18).
- (8) High-frequency oscillator, parts identification (figs. 4-15 and 4-16).
- (9) General parts replacement instructions (para. 4-23).
- (10) Mechanical repairs (para. 4-31).

b. Troubleshooting Test Setup. Dynamic (power on) troubleshooting of the high-frequency oscillator module requires the use of an RF subchassis. A module tester (AN/ARM-87), an external +27.5-volt power source, a frequency meter, and associated test equipment are required for the test being performed. The RF subchassis need not be serviceable except that the chassis wiring, Zener diode CR901, and resistor R901 must be good (to

supply operating voltage to the module). When checking the output level or frequency, always install the cover to avoid detuning the tuned circuits.

c. Troubleshooting Chart. The chart below lists common high-frequency oscillator troubles, probable causes, and procedures for localizing and isolating the troubles. Supplementary data (a above) are referenced in the chart when applicable. Do not rely on the chart for solutions to all troubles. Use the supplementary data as much as possible, adapting your troubleshooting approach to the trouble.

Note. RF measurements are not reliable when made inside the module because removal of the cover detunes the oscillator tuned circuits. Use the tuning cover, supplied with the module tester (AN/ARM-87), for making adjustments. Leave the module tuned to the improper frequency for internal troubleshooting. The switch rotor tab will point to the coil and crystal used for that frequency.

Item	Indication	Probable trouble	Procedure
1	Reading on receiver-transmitter TEST METER is low for position 4.	Low stage gain (Q301), improper bias, defective meter circuit, or dirty switch contacts.	Inspect switch rotor and stator for wear or dirt. Check for proper dc levels at Q301 (fig. 4-17). Use an ohmmeter to check associated circuit components. Caution: Do not measure reverse resistance of Q301 emitter-base junction (fig. 4-17). Check meter circuit (fig. 6-16).
2	No output (all frequencies)-----	Same as item 1 above; also check mechanical alignment.	Same as item 1 above except check mechanical alignment (para. 3-16).
3	No output on some channels----	Defective crystal, improper coil adjustment, defective coil, or defective switch.	Check switch segment for wear, dirt, or corrosion. Try adjusting coil associated with improper frequency. Locate coil by checking position of switch rotor tab. If adjustment is not successful, check for dc continuity through coil. If coil checks good, crystal is probably defective.
4	Incorrect oscillator frequency on some channels.	Defective crystals-----	Replace crystals.
5	Frequency drift on some channels.	Defective crystals-----	Replace crystals.
6	Module uses excessive current---	+18-volt circuit short (or abnormally low resistance) to ground.	Check all capacitors and module wiring for shorts. Check resistor values (fig. 6-16).
7	Oscillator output is intermittent.	Worn or dirty switch segments or warped rotor tab, defective solder joint, coaxial connector or main connector, or diode or capacitor shorting internally.	Check switch, coaxial connector, main connector, and solder joints. Check for intermittent short in diode CR301 or one of the capacitors.

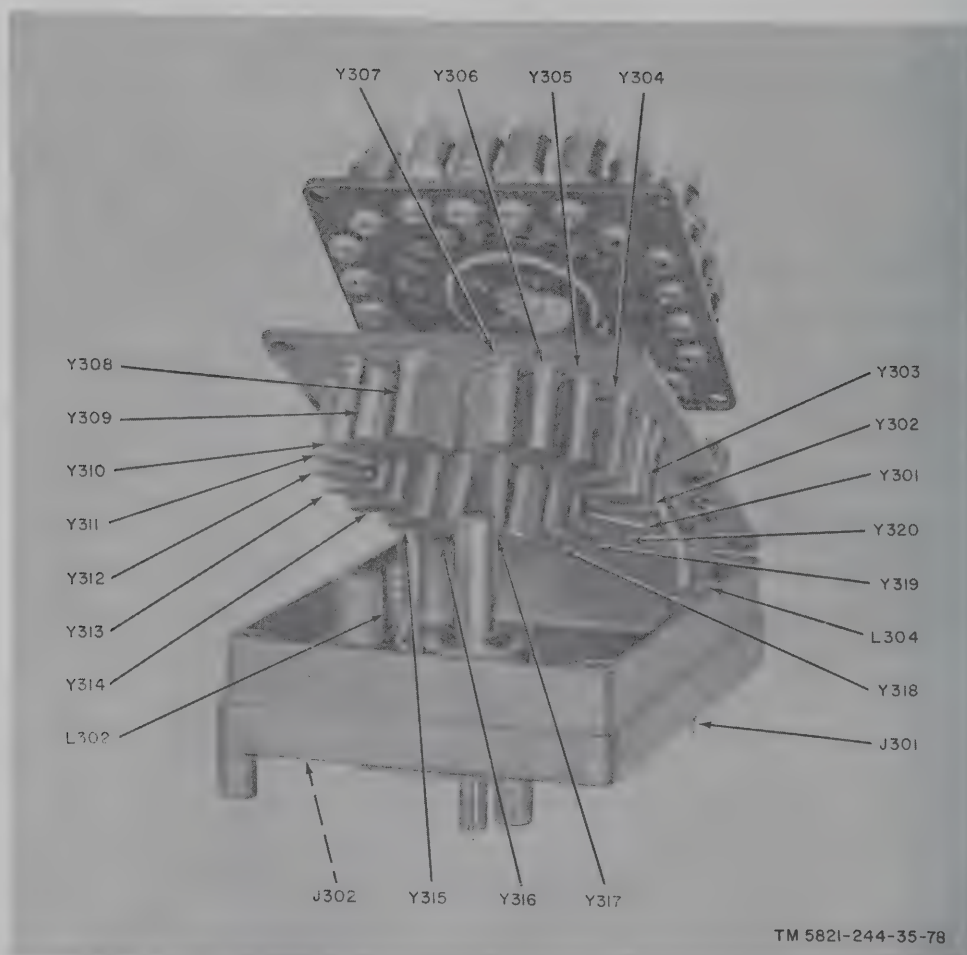


Figure 4-15. High frequency oscillator module, parts identification, bottom view.

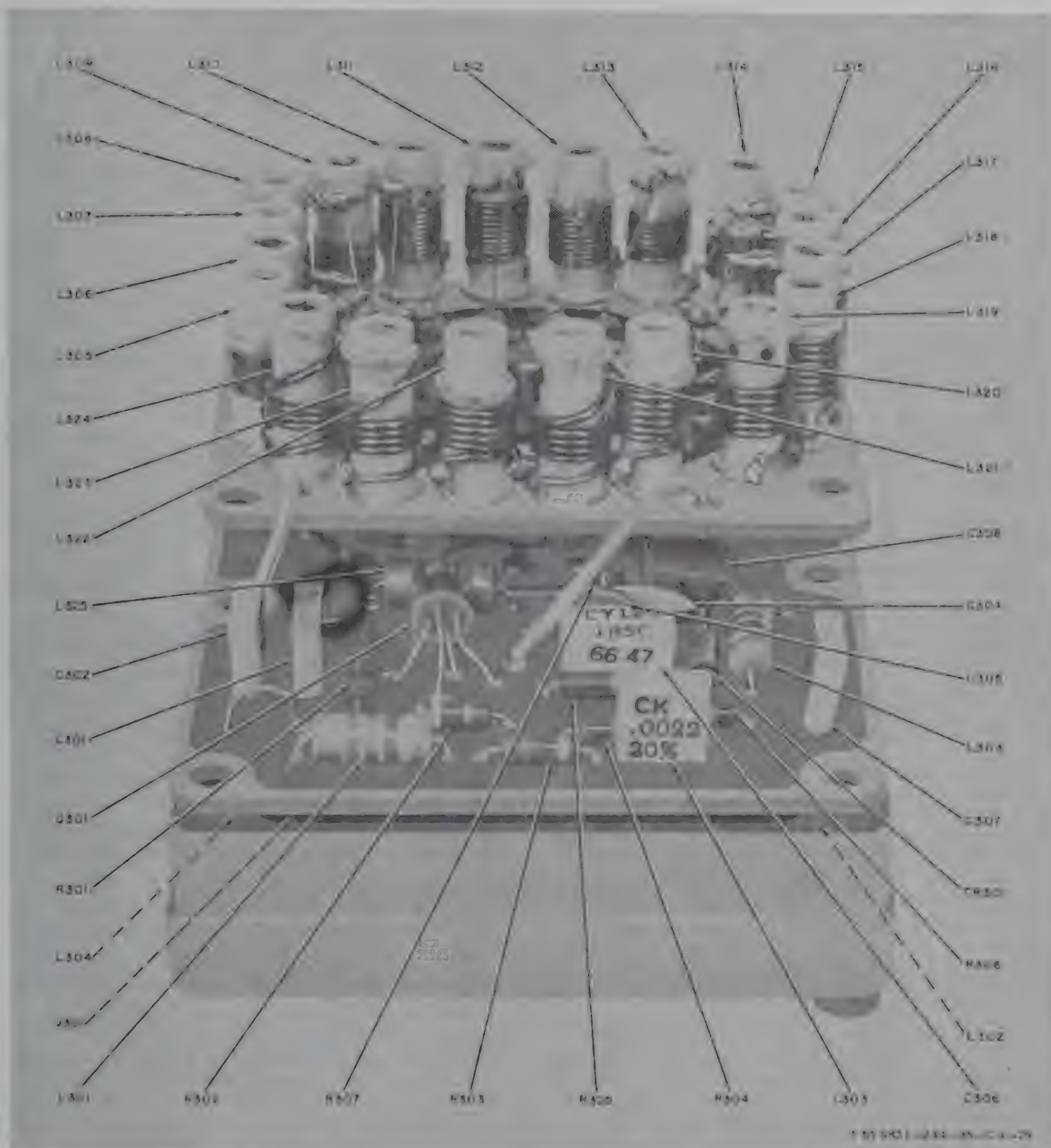
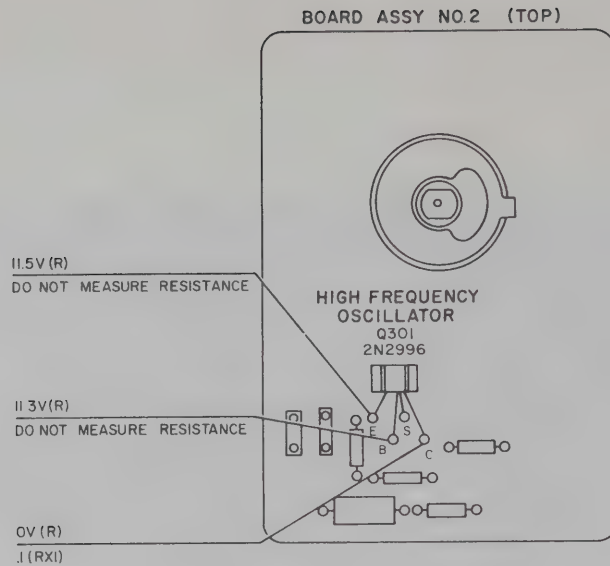


Figure 4-16. High frequency oscillator module, parts identification, top view.



NOTES:

1. ALL MEASUREMENTS WERE MADE IN-CIRCUIT WITH MULTIMETER ME-26/U. VOLTAGES ARE +DC WITH RESPECT TO CHASSIS GROUND UNLESS OTHERWISE NOTED. MEASUREMENTS ARE TYPICAL.

2. (R) INDICATES RECEIVE MODE, (T) INDICATES TRANSMIT MODE, (H) INDICATES HOME MODE.

3. RESISTANCE MEASUREMENTS WERE MADE WITH COMMON METER LEAD TO GROUND AND MODULE REMOVED FROM THE UNIT (NO POWER APPLIED). NUMBERS IN PARENTHESES INDICATE METER SCALE USED.

TM5821-244-35-102

Figure 4-17. High-frequency oscillator module, voltage and resistance diagram.

4-9. Low-Frequency Oscillator Module Troubleshooting

a. General. Use the troubleshooting chart (c below) as an aid in localizing and isolating low-frequency oscillator module troubles. If the trouble symptoms are not known, perform the tests given in paragraph 4-2b, steps (1), (2), and (3). When complicated procedures or illustrations are required, they are referenced in the chart. Make full use of these supplementary procedures and illustrations, which are listed below.

- (1) Module alignment, mechanical (para. 3-16) or electrical (para. 3-18).
- (2) Low-frequency oscillator module, schematic diagram (fig. 1-7).
- (3) Circuit functioning (para. 1-20).
- (4) Module tests (para. 4-2b, steps (1) through (3)).
- (5) Low-frequency oscillator module, voltage, and resistance diagram (fig. 4-20).

- (6) Dc resistance of coils and transformers (para. 4-18).
- (7) Low-frequency oscillator module, parts identification (figs. 4-18 and 4-19).
- (8) General parts replacement instructions (para. 4-23).
- (9) Mechanical repairs (para. 4-30).

b. Troubleshooting Test Setup. Dynamic (power on) troubleshooting of the low-frequency oscillator module requires the use of an RF subchassis, a module tester (AN/ARM-87), an external +27.5-volt power source, a frequency meter, and associated test equipment. The RF subchassis need not be serviceable except that the chassis wiring, Zener diode CR901, and resistor R901 must be satisfactory (to supply operating voltage to the module). When checking the output level or frequency, always install the cover to avoid detuning the tuned circuits.

c. Troubleshooting Chart. The chart below lists common low-frequency oscillator troubles,

b. Troubleshooting Chart.

Item	Indication	Probable trouble	Procedure
1	No power output from receiver-transmitter (power amplifier output is normal).	Coaxial connector P1601 or P1602, relay K1601 or K1602, reflectometer, or sidetone gate rectifier.	Check for direct continuity from P1601 to P1602 and check to see that continuity does not exist from P1601 to module chassis. Use voltage and resistance chart (para. 4-11) and schematic diagram (fig. 6-13) for further checks.
2	Output on upper (or lower) end of the frequency band only.	Relay K1601 or K1602 or an open circuit or short to ground.	Check relays by applying power and grounding pin D. Observe relays for action. Use schematic diagram (fig. 6-13) for further troubleshooting.
3	Weak output on upper (or lower) half of frequency band.	Defective solder joint, leakage path to ground, or improperly tuned coils.	Check solder joints and reheat if in doubt. Use schematic diagram (fig. 6-13) and ohmmeter to check for leakage to ground or try unsoldering one end of any suspected capacitor and checking power output. If necessary, retune coils (c below).
4	High level harmonics present in output.	Improper tuning of coils-----	Perform tuning procedure (c below).
5	No sidetone present (transmission normal).	Sidetone gate detector circuit---	Check diodes CR1603 and CR1604, capacitors C1620 through C1622, resistor R1607, and inductor L1609. Also check coupling capacitor C1610 and wiring from C1610 to P1601.
6	Receiver-transmitter TEST METER indicates abnormal RF FWD (position 10) or RF REFL power (position 11).	Reflectometer or associated circuit.	Use schematic diagram (fig. 6-13) to check for shorts between reflectometer metallic strips. If no shorts are indicated, check all components associated with reflectometer.

c. Operational Test. Perform the tests and adjustments below to insure proper operation of the harmonic filter module after repair, or to determine symptoms if trouble is unknown.

- (1) Remove the top cover from the module and connect the RF signal generator to P1602.
- (2) Connect the AN/URM-85 to P1602.
- (3) Tune the AN/USM-44A and the AN/URM-85 to 70 megacycles.

Note. Carefully tune the AN/URM-85 to the generator frequency to avoid mistuning coils in the procedures that follow.

- (4) Place an RF tuning wand near coils L1605, L1606, L1607, and L1608 (fig. 4-21 for coil identification) to determine whether more or less inductance is needed. If the AN/URM-85 meter reading in-

creases when the brass end of the tuning wand is placed near the coil, less inductance is needed (spread coil). If the reading increases when the iron end of the tuning rod is placed near the coil, more inductance is needed (squeeze coil).

- (5) Tune L1605, L1606, L1607, and L1608 ((4) above) for maximum reading on the AN/URM-85 meter.
- (6) Retune the AN/USM-44A and the AN/URM-85 to 46 megacycles and energize the harmonic filter relays. Apply +27.5 volts dc to pins D and E of the module connector.
- (7) Repeat the procedures given in (4) and (5) above for coils L1605, L1606, L1607, and L1608.
- (8) Replace the module top cover.

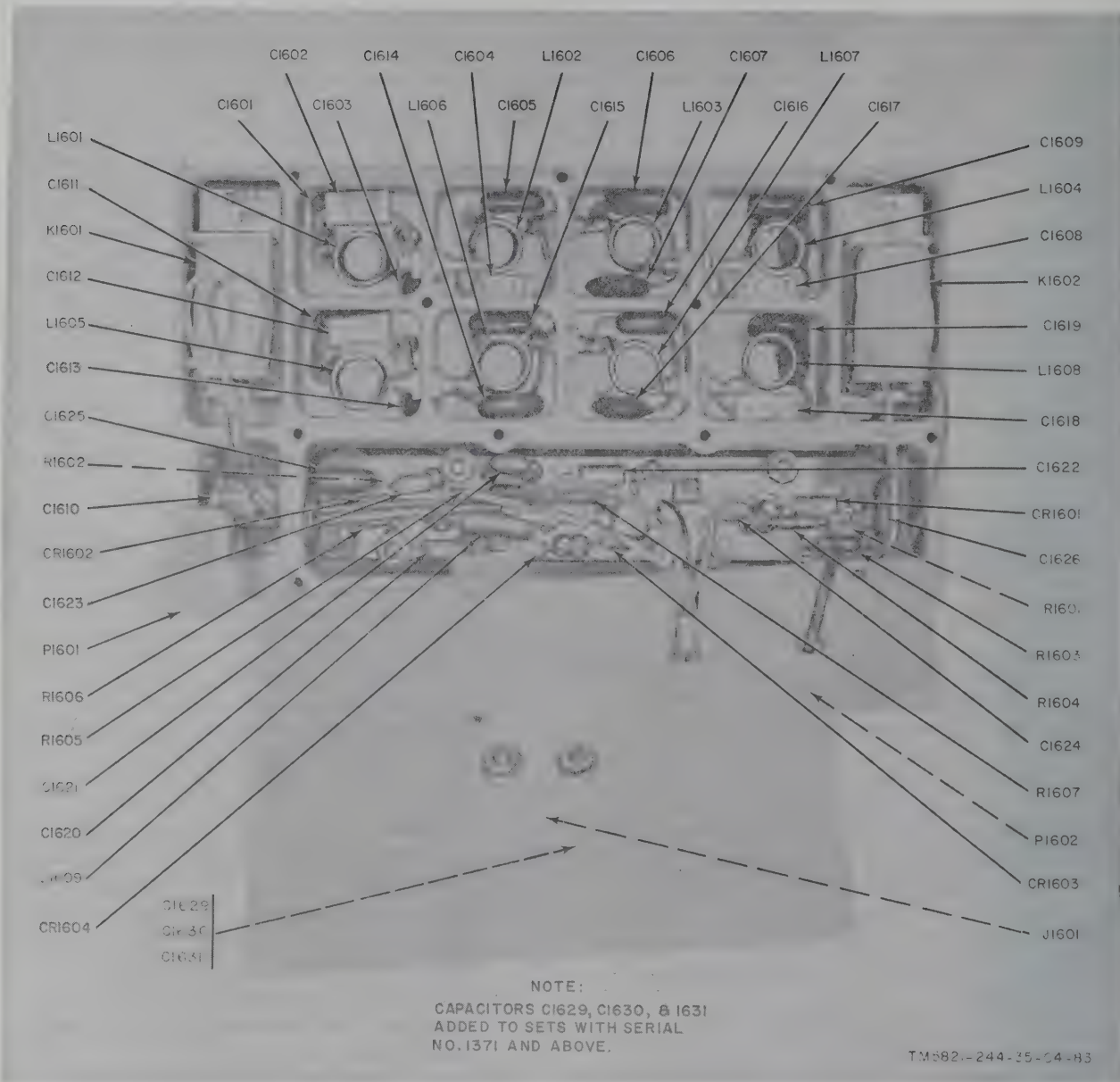


Figure 4-21. Harmonic filter module, parts identification.

(9) With relays energized and the AN/USM-44A and the AN/URM-85 tuned to 46 megacycles as above, note the harmonic filter output as measured on the AN/URM-85 meter. Disconnect the AN/URM-85 and the AN/USM-44A from the harmonic filter and connect the AN/USM-44A direct to the AN/URM-85; note the difference in meter reading on the AN/URM-85. The difference should not exceed 1 db.

(10) Repeat the procedure given in (9) above with the equipment tuned to 60 megacycles. The difference should be not less than 60 db.

(11) Repeat the procedure given in (9) above with the equipment tuned to 63 megacycles. The difference should be not less than 60 db.

(12) If the module fails ((10) or (11) above), tune L1606 (at 65.5 megacycles) and L1607 (at 60 megacycles) for mini-

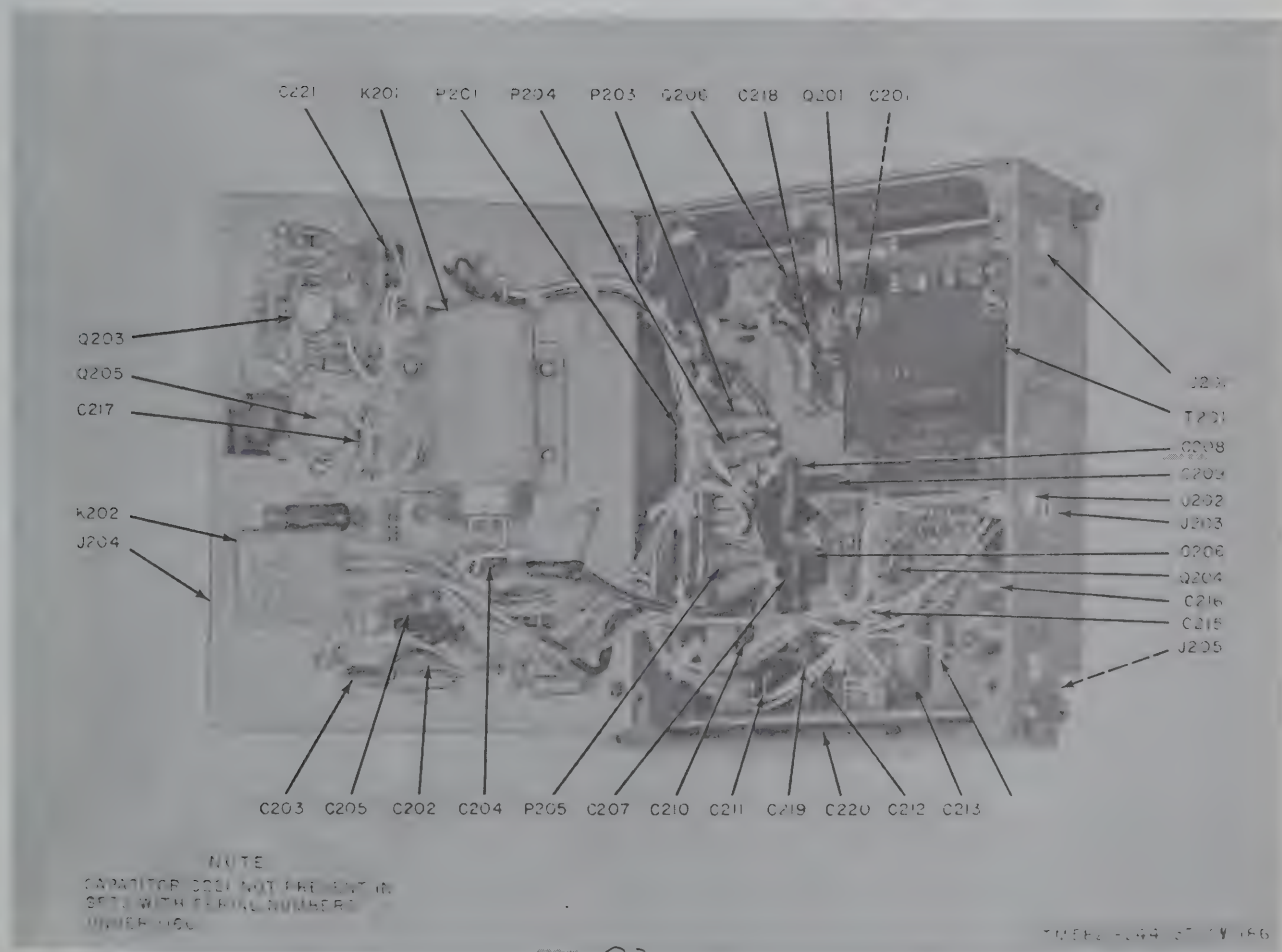


Figure 4-23. Homer module, parts identification.

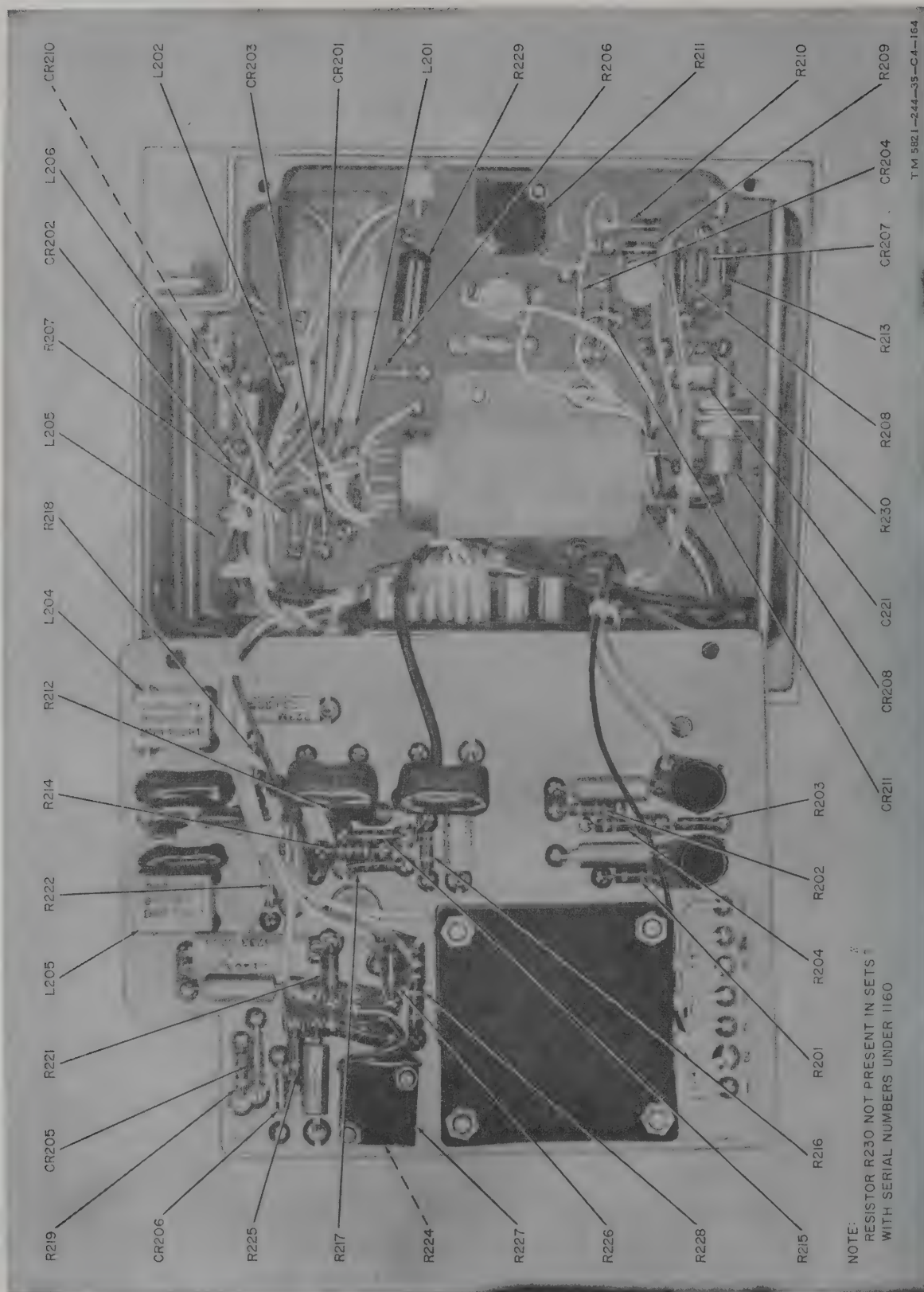


Figure 4-24. Homer module, additional parts identification.

Step	Test name	Circuit selector switches				Instructions	Test limits (percent)	
		A	B	C	D		Min	Max
1	Signal strength-----	8	X	X	X	Depress PRESS TO TEST button and read TEST METER.	25	
2	On-course-----	7	9	4	3	(1) Depress PRESS TO TEST button and read TEST METER. If meter reads down-scale, proceed to next step.	-----	5
		7	8	3	3	(2) Depress the PRESS TO TEST switch and read the TEST METER.	-----	5
3	Synchronous detector----	6	9	3	4	(1) Depress PRESS TO TEST button and adjust 500 KC AMPL control for 68% on TEST METER.		
		(AN/ARM-87 cal)						
		7	9	4	4	(2) Depress PRESS TO TEST button and read TEST METER.	10	60
		7	8	3	4	(3) Depress PRESS TO TEST button and read TEST METER.	10	60
4	Antenna diode switch----	0	4	2	3	(1) Connect RF jumper cable W4 from 30MC jack to RF VM1.		
		(AN/ARM-87 cal)				(2) Depress PRESS TO TEST button and adjust HIGH FREQ AMPL for 100% on TEST METER.		
						(3) Remove RF jumper cable W4 connected in (1) above.		
		0	5	2	3	(4) Connect RF jumper cable W4 from 30MC jack to HOMER RT.		
						(5) Connect RF jumper cable W5 from RF SW IN to J205 (homer module).		
						(6) Connect RF jumper cable W6 from RF SW OUT to RF VM1.		
						(7) Depress PRESS TO TEST button and read TEST METER.	25	
		0	5	0	3	(8) Depress PRESS TO TEST button and read TEST METER.	25 (1) ± 2	
		0	5	1	3	(9) Disconnect RF jumper cable W4 from HOMER RT and connect it to HOMER LT.		
						(10) Depress PRESS TO TEST button and read TEST METER.	25	
		0	5	0	3	(11) Depress PRESS TO TEST button and read TEST METER.	25 (1) ± 2	
						(12) Disconnect all RF jumper cables.		

1No more than 2 meter divisions from the reading in previous test.

4-13. Sel-Call Module Troubleshooting

(fig. 4-26)

a. General. Use the chart (*b* below) as an aid in localizing and isolating sel-call module troubles. If trouble symptoms are not known, perform the tests given in *c* below. After the trouble is localized to a stage, check the stage gain and use the voltage and resistance diagrams, the dc resistance

of coils and transformers chart, and the schematic diagram to trace the trouble to a defective component or connection. After repairing the module, test the module (*c* below). Illustrations and procedures that supplement the troubleshooting chart are:

- (1) Sel-call module, schematic diagram (fig. 6-11).

- (2) Sel-call module, parts identification (fig. 4-25).
- (3) Sel-call module, voltage and resistance diagram (fig. 2-8).
- (4) Dc resistance of coils and transformers para. 4-18).
- (5) Stage gain measurements (para. 4-19).
- (6) Sel-call module adjustments (para. 4-34).
- (7) General parts replacement instructions (para. 4-23).
- (8) Sel-call module test setup, block diagram (fig. 4-26).

b. Troubleshooting Chart.

Item	Indication	Probable trouble	Procedure
1	No reception in tone-squelch mode. Will not squelch in CARR. (Reception good with squelch disabled.)	Zener regulator CR104, CR105, or CR106 or preamplifier Q101.	Check for +18 volts across CR104 (TP8) and +6.5 volts across CR101 at TP1. Check for +9.1 volts across CR105 and +9.1 volts across CR106. If voltages are correct, check stage gain of Q101 (para. 4-19). Check all associated components.
2	No reception in tone-squelch mode.	Selective amplifier Q102 and Q103, tone amplifier Q104, or adjustment of frequency or bandwidth controls R108, R110, and R112.	Check for proper adjustment of R108, R110, and R112 (para. 4-34). If adjustments fail to correct trouble, check gain of Q102, Q103, and Q104. Check voltages at test points (fig. 2-8). Check all components associated with Q102, Q103, and Q104.
3	No reception in carrier squelch mode.	Noise amplifier Q106 oscillating.	Check for signal (approximately 10 kc) (use high gain oscilloscope) at pin 10 of module connector P101 with pin 12 of P101 grounded. If signal is present, Q106 is oscillating. Check Zener diodes CR105 and CR106. Check Q106.
4	No 150-cps tone transmission (tone-squelch reception is normal).	Shorted capacitor C105 or diode CR102 or CR103.	Check for shorted capacitor C105 or diode CR102 or CR103. Check stage gain (para. 4-19) and check for correct voltages at test points (fig. 2-8). Check components associated with Q102 and Q103.
5	Transmitted tone is not the correct frequency.	Adjustment of R108 or defective component in Q102 collector circuit or feedback circuit (C107).	Check adjustment of R108 (para. 4-34). If adjustment cannot be performed or fails to correct the fault, check Q102 and Q103 and associated components.
6	All stations received in tone-squelch mode (no selective calling).	Selective amplifiers Q102 and Q103 oscillating in receive mode.	Check for open diode CR102 or CR103, improper adjustment of R108, R110, or R112 (para. 4-34). Check for incorrect resistor values in Q102 collector and emitter circuit. Replace transistors Q102 and Q103.
7	Unable to adjust SQ ADJ (front panel adjustment) for desired squelch action.	Stage gain of Q105, Q106, or Q107 or defective diode CR108 or Zener diode CR101.	Check stage gain (para. 4-19) of Q105, Q106, and Q107. Check diode CR108 (proper dc level at base of Q107 (fig. 2-8)). Check for +6.5 volts at TP1. (Replace CR101 if not correct.)

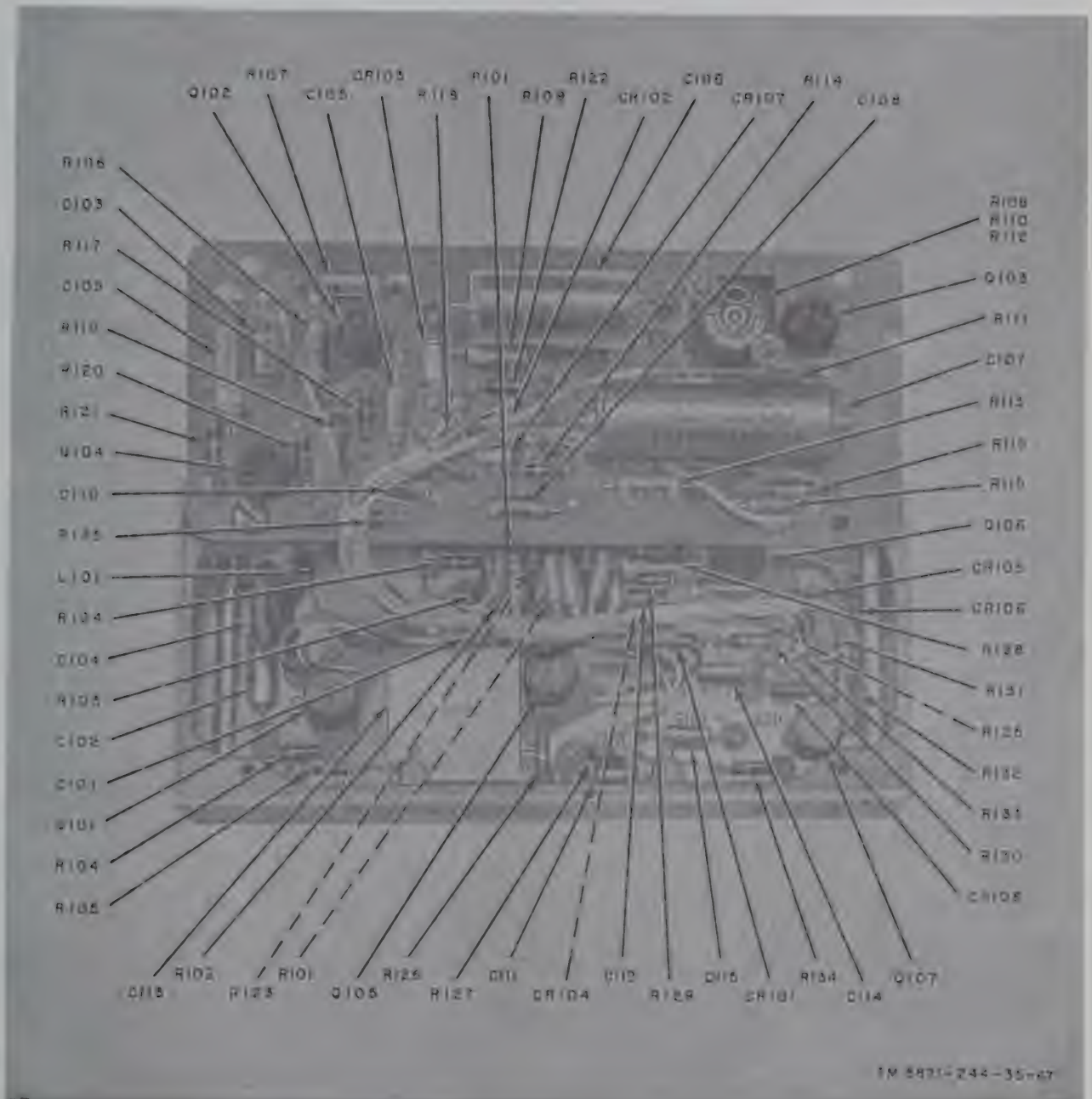
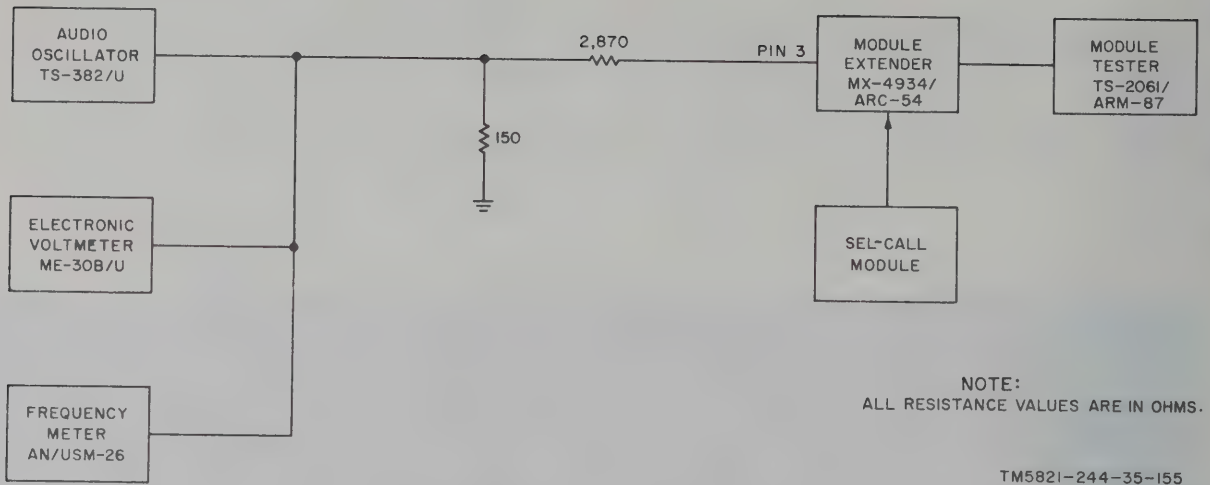


Figure 4-25. Sel-call module, parts identification.



TM5821-244-35-155

Figure 4-26. Sel-call module test setup, block diagram.

c. *Operational Test.* Perform the following tests to verify repair of the sel-call module or to obtain symptoms if trouble is unknown. To perform the tests, plug the module into the module tester (AN/ARM-87), set the module tester switches as indicated in the CIRCUIT SELEC-

TOR switches column, follow the instructions given in the Instructions column, and read the test results prescribed in the Test limits column on the module tester meter. If the module fails to test, perform the adjustments described in paragraph 4-34, and then repeat the tests.

Step	Test name	Circuit selector switches				Instructions	Test limits (percent)	
		A	B	C	D		Min	Max
1	150-cps transmit tone amplitude.	4	5	3	0	Depress PRESS TO TEST button and read TEST METER.	35	58
2	150-cps transmit tone frequency.	5	5	3	1	(1) Depress PRESS TO TEST button and adjust 150 CPS CAL for 65% on TEST METER.	50	
		5	5	3	0	(2) Depress PRESS TO TEST button and read TEST METER.		
3	Bandwidth check (150 cps receive tone amplitude).	5	4	4	1	(1) Depress PRESS TO TEST button and adjust 150 CPS AMPL for 48% on TEST METER.	45	75
		2	4	4	1	(2) Depress PRESS TO TEST button and read TEST METER.		
4	Bandwidth check (1,000 cps).	3	6	6	5	(1) Depress PRESS TO TEST button and adjust 1 KC AMPL for 85% on TEST METER.	55	5
		2	4	4	3	(2) Depress PRESS TO TEST button and read TEST METER.		
5	Squelch disable-----	2	4	4	4	With 1 KC AMPL fully ccw, depress PRESS TO TEST button and read TEST METER.	55	100
6	Noise amplitude--	2	7	4	8	(1) Adjust 10 KC AMPL clockwise (from full ccw) until a sudden increase in meter reading occurs. Adjust for 25% on TEST METER.	---	85
		3	7	5	8	(2) Press PRESS TO TEST and read meter.		

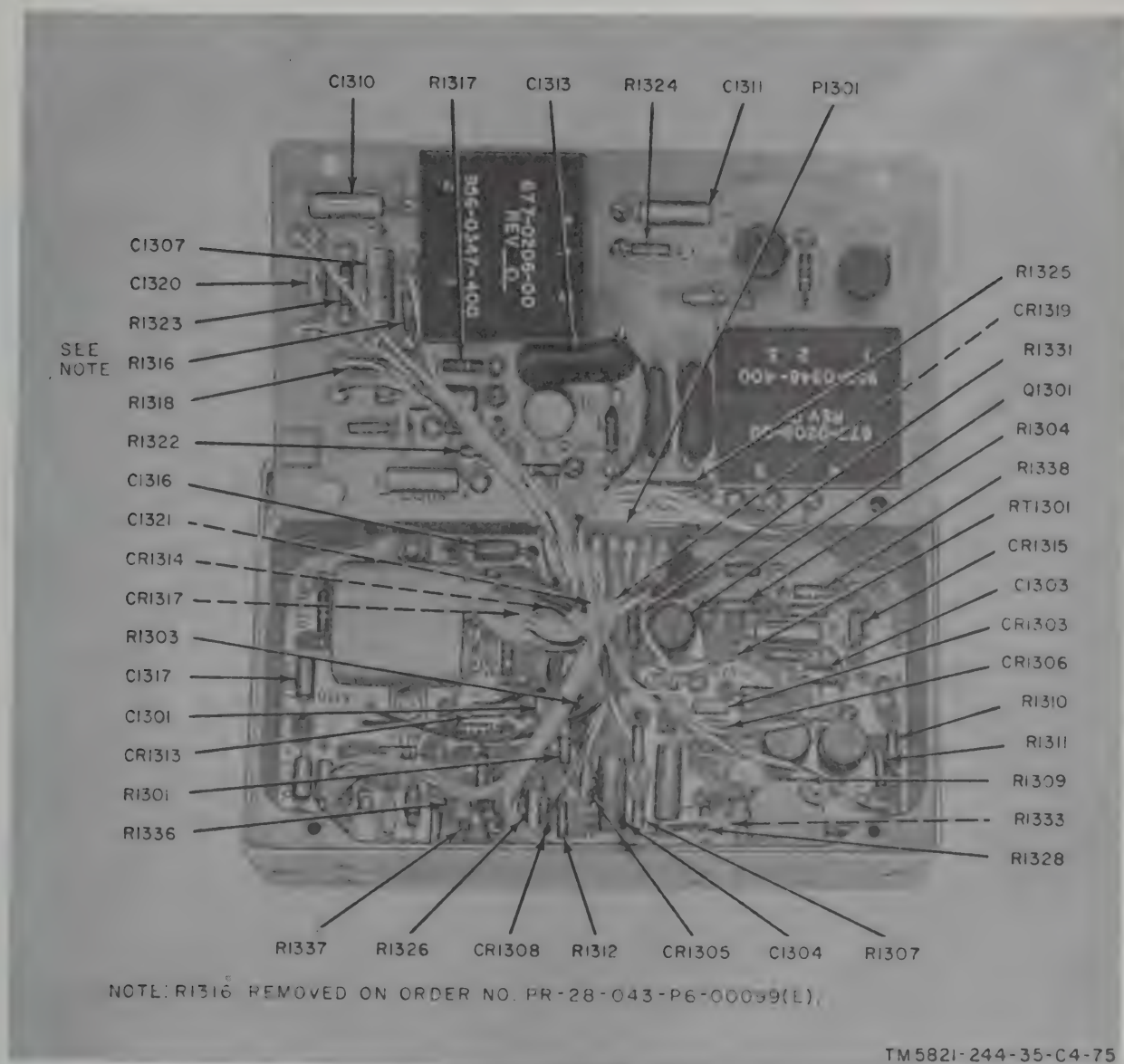


Figure 4-27. Receive audio module, parts identification.

c. Operational Test. Perform the test in the chart below to verify repair of the receive audio module or to obtain symptoms if trouble is unknown. To perform the tests, plug the module into the module tester (AN/ARM-87), set the module tester switches as indicated in the CIRCUIT SELECTOR switches column,

follow the instructions in the Instructions column, and then read the test results prescribed in the Test limits column on the module tester meter. If the module fails the test, perform the adjustments described in paragraph 4-37, and then repeat the tests.

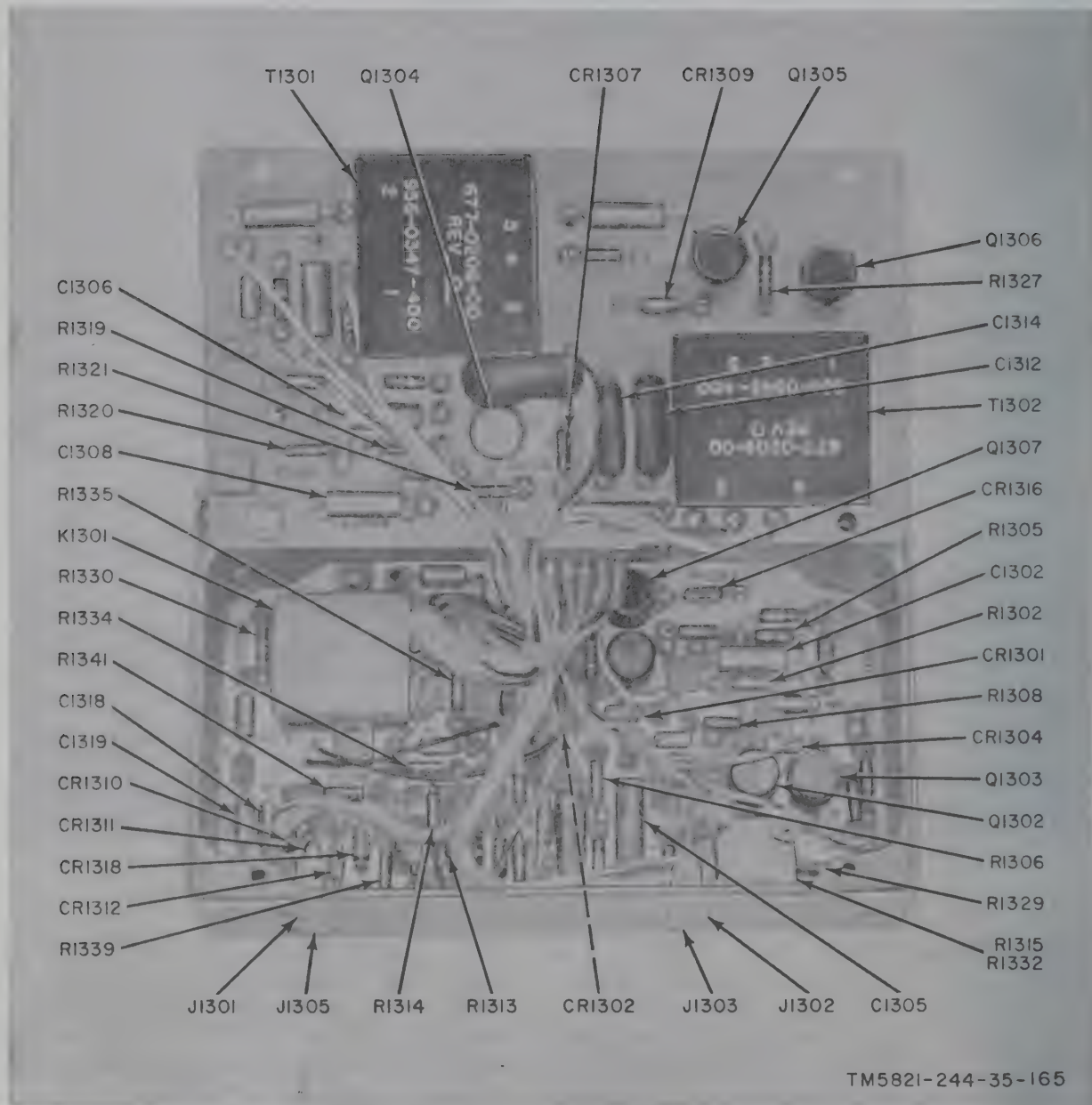


Figure 4-28. Receive audio module, additional parts identification.

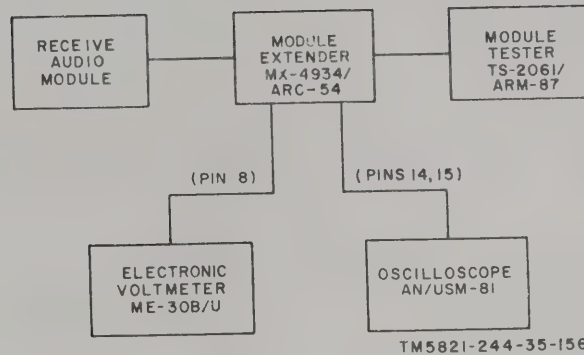


Figure 4-29. Receive audio module test setup, block diagram.

Step	Test name	Circuit selector switches				Instructions	Test limits (percent)	
		A	B	C	D		Min	Max
1	Audio gain-----	5	7	6	0	(1) Depress the PRESS TO TEST button and adjust 1 KC AMPL control for 95% on TEST METER.	50	90
		(AN/ARM-87 cal)				(2) Depress the PRESS TO TEST button and note the reading on the TEST METER		
		6	7	1	0	(3) Adjust the receive audio GAIN control for a reading of 70% on the TEST METER.		
		5	7	6	0	(4) Depress the PRESS TO TEST button and adjust the 1 KC AMPL control for 73% on the TEST METER.	50	-----
		(AN/ARM-87 cal)				(5) Depress the PRESS TO TEST button and read the TEST METER.		
		6	7	1	0	(6) Depress the PRESS TO TEST button and adjust the 1 KC AMPL control for 95% on the TEST METER.		
2	Audio distortion-----	5	1	1	0	(1) Depress PRESS TO TEST button and adjust DIST DET for 55% on TEST METER.	-----	85
		(AN/ARM-87 cal)				(2) Depress PRESS TO TEST button and read TEST METER.		
3a	Carrier squelch level-----	5	1	0	0	(1) Depress PRESS TO TEST button and adjust the 1 KC AMPL control for 92% on TEST METER.	-----	70
		5	7	6	0	(2) Rotate 10 KC AMPL control fully counter-clockwise.		
		(AN/ARM-87 cal)				(3) Depress PRESS TO TEST button and slowly rotate 10 KC AMPL clockwise until TEST METER suddenly drops to zero. (Do not readjust 10 KC AMPL control.)		
		6	7	5	8	(4) Depress PRESS TO TEST button and read TEST METER.		
3b	Relay position 1-----	5	7	5	8	Depress PRESS TO TEST button and read TEST METER.	10	30
		1	7	5	8			

Step	Test name	Circuit selector switches				Instructions	Test limits (percent)	
		A	B	C	D		Min	Max
3c	Squelch disable.....	6	7	4	8	Depress PRESS TO TEST button and read TEST METER.	50	90
3d	Relay position 2.....	1	7	4	8	Depress PRESS TO TEST button and read TEST METER.	10	30
3e	Transmit mode.....	6	7	2	8	Depress PRESS TO TEST button and read TEST METER.	-----	5
4	Unsquench 150-cps amplitude.	5	7	6	0	(1) Depress PRESS TO TEST button and adjust the 1 KC AMPL control for 92% on TEST METER.		
		(AN/ARM-87 cal)				(2) Rotate the 150 CPS AMPL control fully clockwise.		
		6	0	6	1	(3) Depress PRESS TO TEST button and slowly decrease the setting of 150 CPS AMPL until TEST METER suddenly drops to zero. (Do not readjust 150 CPS AMPL control.)		
5	Sidetone.....	5	0	4	1	(4) Depress PRESS TO TEST button and read TEST METER.	20	70
		4	2	X	7	(1) Depress PRESS TO TEST button and adjust 1 KC AMPL for 92% on TEST METER.	50	80
		6	7	2	7	(2) Depress PRESS TO TEST button and read TEST METER.		
6	Module recalibrate.	6	7	1	0	After successfully completing the above tests, return the receive audio GAIN control to its previous setting as read in step 1, instruction (2).		

4-15. Transmit Audio Module Troubleshooting

(fig. 6-10)

a. General. Use the following chart to aid in localizing and isolating transmit audio module troubles. If trouble symptoms are not known, perform the test given in *c* below. After the trouble is localized to a stage, check the stage gain and use the voltage and resistance diagram, the dc resistance of coil and transformer chart, and the module schematic diagram to isolate the trouble to a defective component or connection. After repairing the module, test the module (*c* below). Illustrations and procedures that supplement the troubleshooting chart are:

- (1) Transmit audio module, schematic diagram (fig. 6-10).
- (2) Transmit audio module test setup, block diagram (fig. 4-32).
- (3) Transmit audio module, voltage and resistance diagram (fig. 2-10).
- (4) Dc resistance of coils and transformers (para. 4-18).
- (5) Stage gain measurements (para. 4-19).
- (6) Transmit audio module adjustments (para. 4-38).
- (7) Transmit audio module, parts identification (figs. 4-30 and 4-31).
- (8) General parts replacement instructions (para. 4-23).

b. Troubleshooting Chart.

Item	Indication	Probable trouble	Procedure
1	No transmission (reading on receiver-transmitter TEST METER, position 7 low or zero).	Fm oscillator (Q1403), modulator (C1415), or associated circuit defective; open Q1403 emitter circuit or improper adjustment of L1401.	Check adjustment of L1401 (para. 4-38). Check voltages on Q1403 (fig. 2-10) and check stage gain (para. 4-19). Check C1415 and associated components including Zener diode CR1402.
2	Transmitter power is good but audio is distorted.	Adjustment of R1402, preamplifier Q1401, amplifier Q1402, transformer T1401, preemphasis circuit, or modulator circuit C1415 and associated components.	Check adjustment of R1402 (para. 4-38). Use electronic voltmeter to trace audio from pins 1 and 3 of P1401 through circuits named in Probable trouble column. When signal is lost (or abnormally reduced), check gain of preceding stage (para. 4-19) and check all voltages and resistances in the associated circuit (fig. 2-10). If all voltages and stage gains are good but modulation is still low, replace C1415.
3	Transmit audio is distorted-----	Improper adjustment of L1401, a transistor or C1415 is defective or being overdriven; preemphasis circuit or T1401 defective.	Check L1401 adjustment (para. 4-38). Check transistor voltages (fig. 2-10) or use an oscilloscope to trace the circuit for the source of the distortion. If the distortion seems to appear first in the modulator-oscillator circuit and all other checks are good, replace C1415.
4	Weak or no sidetone-----	Adjustment of R1413 (SIDE-TONE), diode CR1403, R1411, R1415, R1414, C1407, C1403, or T1401.	Check adjustment of R1413 (para. 4-38). If this does not correct the fault, check for sidetone audio between terminals 5 and 6 of T1401. If none, check transformer winding dc resistance (para. 4-18). If audio is present at terminals 5 and 6 of T1401, check components listed in Probable trouble column.
5	No 150-cps tone transmission---	Shorted C1409; open R1420, R1436, or C1410, defective R1424, C1444, R1425, or CR1402.	Check components in order listed or trace signal from pin 8 of P1401 to oscillator circuit with electronic voltmeter.
6	Faulty retransmit interlock operation.	Relay K1401, diode CR1405, capacitor C1423, or resistor R1433.	If relay K1401 does not operate when transmit button is pressed (or pin 2 of P1401 is grounded), check to see that C1423 is not shorted. If C1423 is good, replace K1401. If relay operates but delay is not right (radios oscillate back and forth in retransmit mode), check R1433, C1423, and CR1405.
7	Abnormal (or no) security operation.	Security input circuit or open diode CR1404.	Check CR1404 for an open. If CR1404 is good, check all components in security input circuit (from pin 13 of P1401 to oscillator circuit).

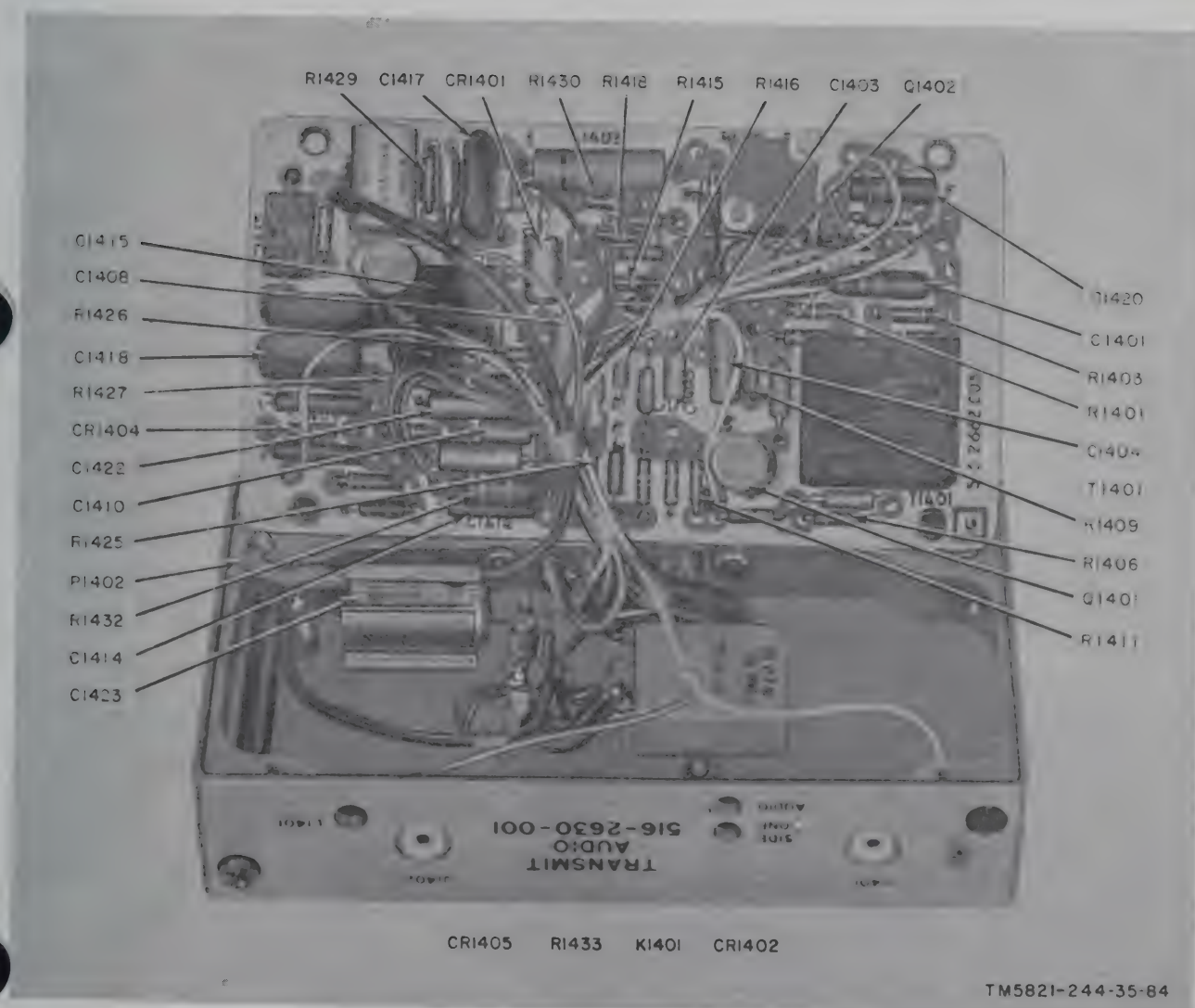


Figure 4-30. Transmit audio module, parts identification.



Step	Test name	Circuit selector switches				Instructions	Test limits (percent)	
		A	B	C	D		Min	Max
1	500-kc frequency check--	4	0	7	3 (AN/ARM-87 cal)	(1) Set 1 KC AMPL fully ccw, then depress PRESS TO TEST button and adjust 500 KC FILTER for 47% on TEST METER.	40	----
		4	1	7	3	(2) Depress PRESS TO TEST button and read TEST METER. If out of tolerance, adjust L1401 (transmit audio module) for a reading within tolerance and proceed to (3) below. If the reading is within tolerance, proceed to step 2.		
		6	1	7	3	(3) Depress PRESS TO TEST button and adjust L1401 (transmit audio module) for a peak on TEST METER.		
2	500-kc amplitude-----	4	6	7	4	Depress PRESS TO TEST button and read TEST METER.	45	98
3	Distortion check-----	3	2	6	4 (AN/ARM-87 cal)	(1) Depress PRESS TO TEST button and adjust 1 KC AMPL for 57% on TEST METER.		
		3	2	1	4 (AN/ARM-87 cal)	(2) Depress PRESS TO TEST button and adjust DIST DET for 45% on TEST METER.		
		3	2	0	4	(3) Depress PRESS TO TEST button and read TEST METER.	-----	85
4	Deviation check-----	3	6	6	4 (AN/ARM-87 cal)	(1) Depress PRESS TO TEST button and adjust 1 KC AMPL for 50% on TEST METER.		
		3	6	2	4	(2) Depress PRESS TO TEST button and read TEST METER.	50	90
5	150-cps tone input-----	3	5	4	1	(1) Depress PRESS TO TEST button and adjust 150 CPS AMPL for 92% on TEST METER.		
		3	5	2	1	(2) Depress PRESS TO TEST button and read TEST METER.	10	40
6	Sidetone gate-----	3	5	6	3 (AN/ARM-87 cal)	(1) Depress PRESS TO TEST button and adjust 1 KC AMPL for 57% on TEST METER.		
		3	5	7	3	(2) Depress PRESS TO TEST button and read TEST METER.	-----	20
7	Sidetone-----	3	6	7	3	Depress PRESS TO TEST button and read TEST METER.	40	
8	Security-----	3	7	7	3	Depress PRESS TO TEST button and read TEST METER.	-----	18
9	Carrier ground 1-----	0	8	5	4	Depress PRESS TO TEST button and read TEST METER.	30	50
10	Carrier ground 2-----	0	8	6	4	Depress PRESS TO TEST button and read TEST METER.	-----	10
11	Retransmit ground 1----	0	9	6	4	Depress PRESS TO TEST button and read TEST METER.	40	70
12	Retransmit ground 2----	0	9	6	3	Depress PRESS TO TEST button and read TEST METER.	-----	5
13	Meter output-----	2	9	7	4	Depress PRESS TO TEST button and read TEST METER.	35	
14	Security input--	3	2	6	5	(1) Depress the PRESS TO TEST button and adjust the 1 KC AMPL control for 100% on TEST METER.		
		3	2	6	9	(2) Depress the PRESS TO TEST button and read the TEST METER.		

4-16. Power Supply Module Troubleshooting

a. General. Use the chart below to aid in localizing and isolating troubles in the power supply module. If trouble symptoms are not known, perform the tests given in *c* below. After the trouble is localized to a circuit or stage, check voltages and resistances, stage gain and wiring, and use the schematic diagram to isolate the trouble to a faulty component or connection. After repairing the module, test the module (*c* below). Illustrations

and procedures that supplement the troubleshooting chart are:

- (1) Power supply module, schematic diagram (fig. 1-26).
- (2) Power supply module, voltage and resistance diagram (fig. 2-11).
- (3) Dc resistance of coils and transformers (para. 4-18).
- (4) Stage gain measurements (para. 4-19).
- (5) Power supply parts identification (figs. 4-33, 4-34, and 4-35).
- (6) General parts replacement instructions (para. 4-23).

b. Troubleshooting Chart.

Item	Indication	Probable trouble	Procedure
1	Fuse F1001 blows when transmit button is pressed.	Relay K1501 or power supply wiring shorted to ground (chassis).	Check for a short to ground from pin 10 of P1501 (unsolder wires from contacts 1 and 5 of K1501). If wiring is good, replace K1501.
2	High voltage present in receive mode.	Relay K1501 or wiring shorted to ground (chassis).	Check for continuity to ground on pin 12 of P1501 (with wire unsoldered from contact 5 of K1501). If wiring is good, replace K1501.
3	Fuse F1002 blows when power is applied.	Despiking circuit (including C1501), 54-volt inverter, -27-volt circuit, or channel tone output circuit.	If trouble is not apparent from careful inspection of components, try disconnecting one end of C1501 and applying +27.5 volts direct to terminal 2 of T1502. If overload condition does not exist at this point, the trouble is in the despiking circuit. If overload exists here, the 54-volt inverter or the -27-volt rectifier circuit is defective. Use the voltage and resistance diagram (fig. 2-11) to make further checks in the suspected circuit. Check C1501 for internal shorting and check transformers T1501 and T1502 windings (para. 4-18). If resistor R1502, R1503, or R1505 is defective, be sure to replace it with the correct power-rated resistor (6.5 watts).
4	Fuse F1002 blows when transmit button is pressed.	High-voltage rectifier circuit, relay K1501, -27.5-volt rectifier circuit, or channel tone output circuit.	Check high-voltage filter capacitor C1508 for internal shorting. Check diodes CR1504 through CR1507. Check transformer T1503 (para. 4-18). Check relay K1501 for a short between terminals 4 and 8 or 3 and 7 (with wires disconnected from the terminals). Check -27.5-volt rectifier and filter circuit, T1502, R1510, and R1511.
5	No channel tone (dc outputs and 54 volts ac are good).	Channel tone output circuit.	Check C1506 for an open. Check R1511 and R1510. Check for a wiring short to ground (chassis) at pin 4 of P1501.

c. Operational Test. Perform the following tests to verify repair of the fixed IF module or to obtain symptoms if trouble is unknown. To perform the tests, plug the module into the module tester (AN/ARM-87), set the module tester switches as indicated in the **CIRCUIT SELECTOR**

switches column, follow the instructions given in the Instructions column, and read the test results prescribed in the Test limits column on the module tester meter. If the module fails the test, perform the adjustments prescribed in paragraph 4-36, and then repeat the tests.

Step	Test name	Circuit selector switches				Instructions	Test limits (percent)	
		A	B	C	D		Min	Max
1a	Discriminator alignment.	3	6	8	5	(1) Set the 1 KC AMPL control fully ccw, then depress PRESS TO TEST button and adjust 500 KC AMPL for 64% on TEST METER.	37	85
		(AN/ARM-87 cal)						
		3	6	6	5	(2) Depress PRESS TO TEST button and adjust 1 KC AMPL for 74% on TEST METER.		
		(AN/ARM-87 cal)						
		6	6	6	5	(3) Depress PRESS TO TEST button and read TEST METER. If reading is not within limits, perform the procedures given in (4), (5), and (6) below.		
		3	3	1	5	(4) Adjust DIST DET control for 55% on the TEST METER.		
		3	3	0	5	(5) Adjust L1205 (fixed IF module) for minimum indication on TEST METER.		
						<i>Note.</i> If off-scale reading is obtained, reduce setting of DIST DET for an on-scale reading.		
1b	Output to encoder 1-----	6	8	6	5	(6) Repeat (1), (2), and (3) above. Depress PRESS TO TEST button and read TEST METER.	22	75
1c	Agc to homer module 1--	0	7	6	5	Depress PRESS TO TEST button and read TEST METER.	20	40
1d	Agc to RF amplifier and vif modules.	0	6	6	5	Depress PRESS TO TEST button and read TEST METER.	17	50
1e	Output to encoder 2-----	3	8	8	6	(1) Set 1 KC AMPL control fully ccw, then depress PRESS TO TEST button and adjust 500 KC AMPL for 64% on TEST METER.		
		(AN/ARM-87 cal)						
		3	6	6	5	(2) Adjust 1 KC AMPL for 74% on TEST METER.		
		6	8	8	6	(3) Depress PRESS TO TEST button and read TEST METER.	22	75
		0	7	8	6	Depress PRESS TO TEST button and read TEST METER.	43	75
1g	Agc to RF amplifier and modules 2.	0	6	8	6	Depress PRESS TO TEST button and read TEST METER.	48	75
2	500-kc amplitude to homer module.	3	4	8	7	(1) Depress PRESS TO TEST button and adjust 500 KC AMPL for 64% on TEST METER.	15	50
		(AN/ARM-87 cal)						
		3	4	9	7	(2) Depress PRESS TO TEST button and read TEST METER.		

4-18. Dc Resistance of Transformers and Coils

The dc resistance of all transformers and coils in the receiver-transmitter are given below. All values are measured on Multimeter ME-26A/U. Because of differences in meters and circuit tolerances, the readings may vary ± 20 percent.

Caution: When checking a coil or transformer having more than 1 ohm of resistance, remove the part from the circuit (or disconnect one lead) to avoid erroneous readings and to avoid the possibility of damage to semi-conductors that may be connected across the part being checked.

Module	Transformer or coil	Terminals	Ohms
Homer-----	T201-----	1-2	8.5
		3-4	80
		5-7	4.5
	L201, L202, L203, L206, L204, L205----		Less than 1
Receive audio--	T1301-----	1-2	320 max
		3-5	16 max
	T1302-----	1-3	192 max
		4-5	18 max
Transmit audio.	T1401-----	1-2	37
		3-4	15
		5-6	28
	L1401-----		7
Power supply--	T1501-----		48.3 max
		1-4	9.75
		1-2	Less than 1
	T1502-----	3-4	Less than 1
		1-3	Less than 1
		4-6	6.8
	T1503-----	1-3	Less than 1
		4-6	30
Sel-call-----	L101-----		28
Fixed IF-----	L1201, L1202, L1206.		48.3 max
	L1203, L1204.		11.3 max
	L1205-----		12
Harmonic filter.	L1601-L1609--		Less than 1
RF amplifier--	T601-----	Red to blue.	10.5
	L601-L618----		Less than 1
High-frequency oscillator.	L301-L324----		Less than 1
Low-frequency oscillator.	L401-L403----		Less than 1
	L404-----		11.3 max
	L405, L406----		3 max

Module	Transformer or coil	Terminals	Ohms
Variable IF----	L501-L506----		Less than 1
	L507-L509----		11.3 max
	L801-L805----		Less than 1
Power amplifier.			

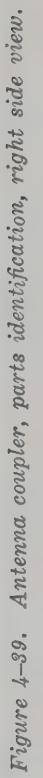
4-19. Localizing Troubles by Stage Gain Measurements

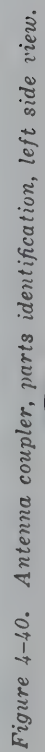
a. General. When reception or transmission is weak and cannot be sufficiently improved by alignment of the radio set, the trouble is often due to low gain in one or more of the amplifier stages in the receiver-transmitter unit. Instructions are provided below for making measurements to determine the approximate gain of each stage. Since the voltage gain of a stage is simply the ratio of the output to the input signals, gain may be checked by measuring the signal level at the input (emitter or base) and comparing it with the signal level at the output (emitter or collector). Because of circuit tolerances, primary voltage variations, meter tolerances etc., the actual values measured may vary from module to module; the variations are within reasonable limits. The computed gains, however, should be reasonably close to those indicated by the chart. (If in doubt, check the transistor and associated circuit.) Only the main chassis modules are included in the chart. Measurement of RF signal levels in the RF subchassis modules is not practical because of the loading caused when test probes are placed near RF circuits. Dc levels (figs. 4-5, 4-10, 4-14, 4-17, and 4-20) are useful for troubleshooting these modules.

b. Test Setup for Stage Gain Checks. To make stage gain checks, plug the defective module into the module tester and apply power to the test set. Make measurements with an Electronic Voltmeter ME-30B/U except when otherwise indicated in the Instructions column.

c. Stage Gain Chart. The chart below gives ac voltages (rms) measured at inputs and outputs of transistors in the main chassis modules. Refer to the voltage and resistance diagrams (figs. 2-7 through 2-12, 4-5, 4-10, 4-14, 4-17, and 4-20) for dc measurements in all modules.

Note. Follow the procedures given in the Instructions column before proceeding with each measurement.





k. High Frequency Oscillator Module Removal.

Note

Newer model RF subchassis allow removal of high frequency oscillator module without removing the variable IF module; for these units, skip steps (1) through (3).

(1) Remove the variable IF module-mounting screws (two in RF subchassis baseplate and three in RF subchassis gear train (figs. 5-7 and 4-1)). Remove the high frequency oscillator module mounting screws (four in gear train (fig. 4-1)).

(2) Loosen the setscrews in both the variable IF and high frequency oscillator module drive shafts.

(3) Slide the variable IF module away from the gear train far enough to allow the high frequency oscillator module splined shaft to clear the gear train.

(4) Disconnect electrical connector P905 from module connector J302 and coaxial connector P602 from J301.

(5) Remove the high frequency oscillator module by pulling it directly away from gear train.

l. High Frequency Oscillator Module Replacement.

(1) Rotate the splined shaft of the module so that the scribe mark on the edge of the hub aligns with the scribe mark on the module base (fig. 6-7, detail C).

(2) Insert the splined shaft into the RF subchassis gear train and secure the module to the gear train with four module-mounting screws.

(3) Tighten the setscrew in the module splined shaft.

(4) Connect coaxial connector P602 to J301 on the module.

(5) Connect electrical connector P905 to J302 on the module.

4-25. Subchassis Gear Train Repairs (fig. 4-42)

All gears, bearings hubs, and screws in the gear train are replaceable. The gear train may be disassembled without removing the modules if the module shaft setscrews are loosened and all module mounting screws are removed from the

gear train side of the RF subchassis. To disassemble the gear train, remove the 9 Phillips flathead screws (1) that hold the gear housing plate (2) to the gear housing (3). Remove the gear housing plate. All gears are now accessible and may be removed and replaced in any sequence. The gears may be lifted directly out of the housing. The bearings require only slight pressure to free them from the gear housing or gear housing plate. Note the direction of removal in figure 4-42. The three module alignment gears (4, 5, and 6) may be removed from their hubs (7, 8, and 9 respectively) by removing the three slothead screws (10, 11, and 12 respectively) in each.

4-26. RF Power Amplifier Module Repairs (fig. 4-43)

The RF power amplifier module has several moving parts, which may require replacement when worn. These parts are shown disassembled in figure 4-43. The following subparagraphs explain the removal and replacement of these mechanical parts. Paragraph 4-23 gives general instructions for the removal and replacement of electronic parts.

a. Removal of Matched Cams (fig. 4-43). The power amplifier module cams are a matched pair and should be removed as a pair. Perform the following steps to remove the cams.

(1) Loosen the four setscrews (1) in the right-hand cam-locking collar (2) and the four setscrews (3) in the left-hand cam-locking collar (4). Remove both collars.

(2) Lift the slug rack (9) slightly so that the cam follower rod (5) exerts no pressure on the cam. Remove the right-hand cam (7).

(3) Repeat the same procedure to remove the left-hand cam (8).

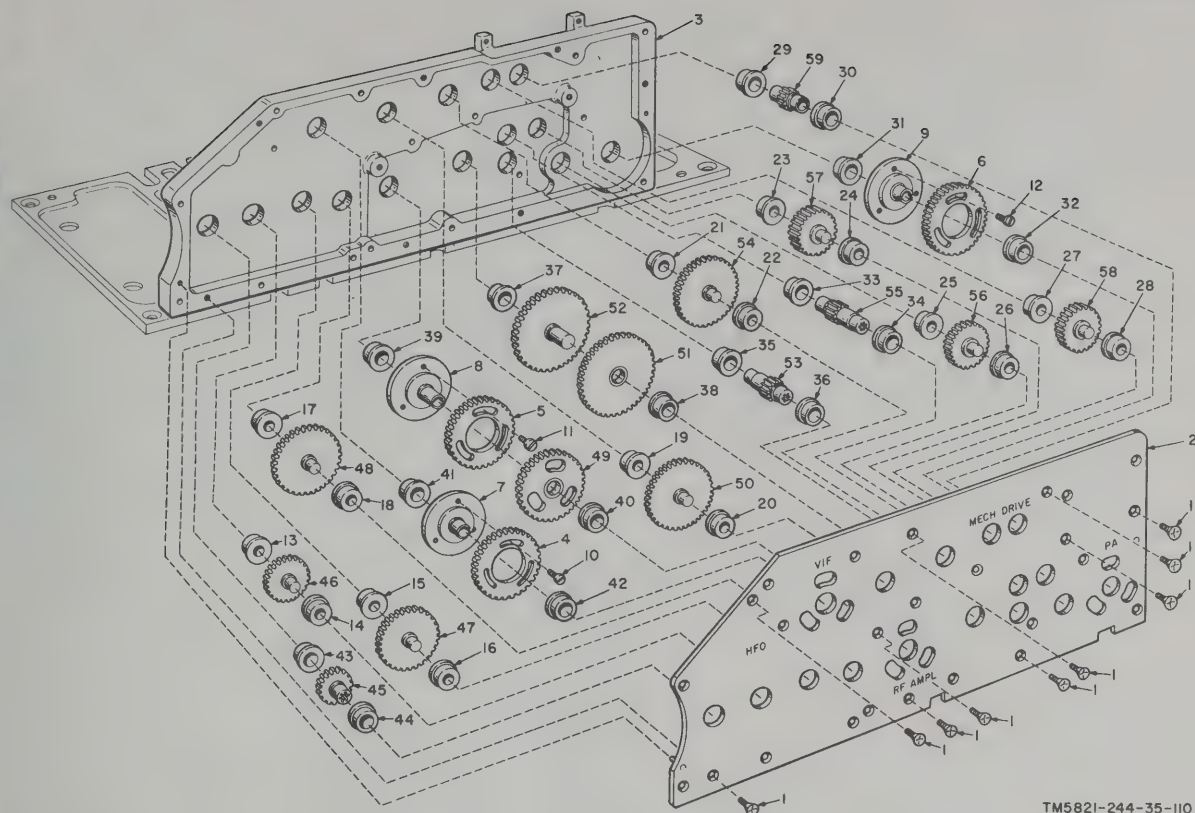
b. Replacement of Matched Cams. The power amplifier module cams are a matched pair and should be replaced with a matched pair. Perform the following steps to replace the cams.

(1) Look through the two holes in the left end (end opposite driven end) of the module and rotate the drive shaft so that the variable capacitor rotor plates are fully meshed with the stator plates.

(2) Hold up on the slug rack (9) and in-

stall the right-hand cam (7) over the driven end of the drive shaft. Place the cam-locking

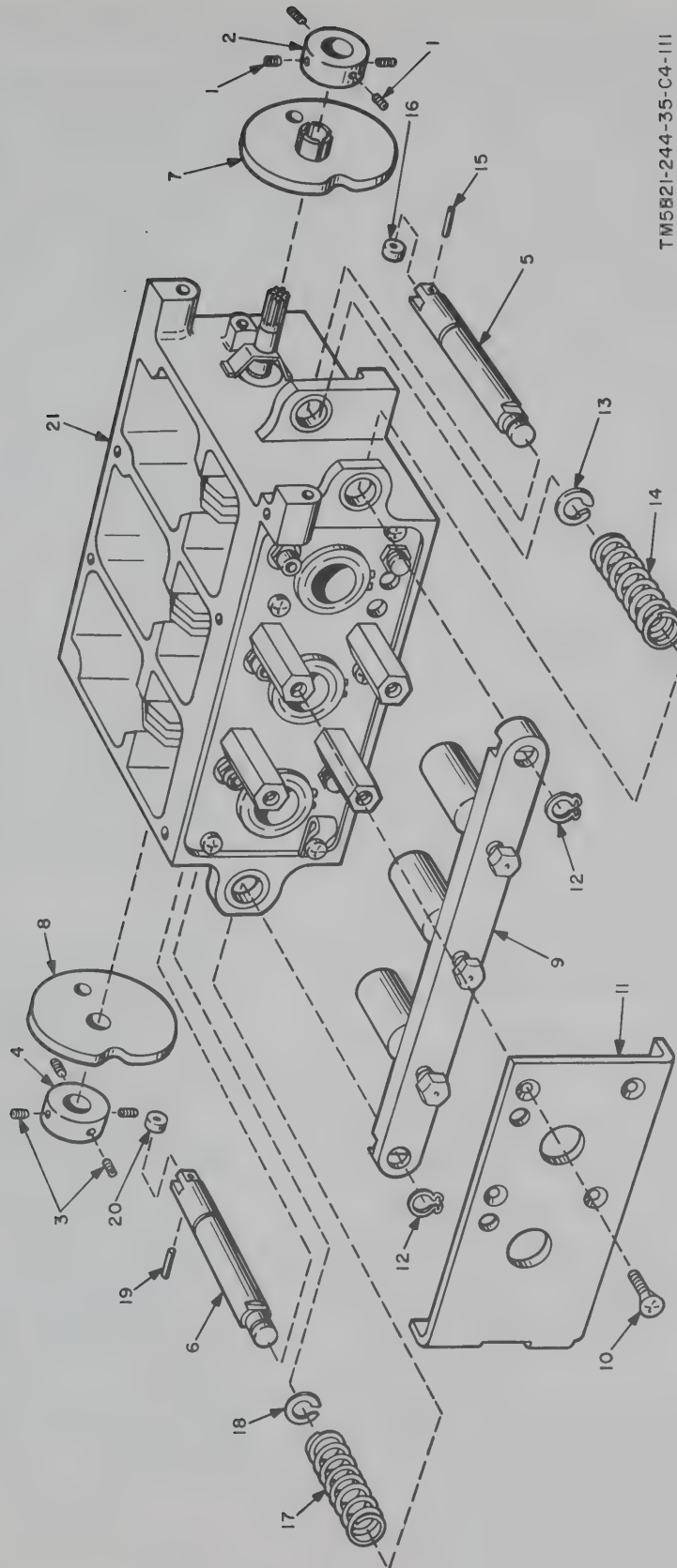
collar (2) over the drive shaft (flush against the cam) and tighten the four setscrews (1).



TM5821-244-35-110

- | | | | |
|----|---|----|---------------------------------|
| 1 | Screw H171, Phillips flathead, 4-40 x 5/16-inch | 31 | Radial bearing, MP105, 1/4-inch |
| 2 | Gear housing plate | 32 | Radial bearing, MP105, 1/4-inch |
| 3 | Machined gear housing | 33 | Radial bearing, MP105, 1/4-inch |
| 4 | 80-tooth gear MP907 | 34 | Radial bearing, MP105, 1/4-inch |
| 5 | 80-tooth gear MP907 | 35 | Radial bearing, MP105, 1/4-inch |
| 6 | 80-tooth gear MP907 | 36 | Radial bearing, MP105, 1/4-inch |
| 7 | Hub, VIF | 37 | Radial bearing, MP105, 1/4-inch |
| 8 | Hub, RF AMPL | 38 | Radial bearing, MP105, 1/4-inch |
| 9 | Hub, PA (same as item 7) | 39 | Radial bearing, MP105, 1/4-inch |
| 10 | Screw, H154, Slothead, 4-40 x 1/8-inch | 40 | Radial bearing, MP105, 1/4-inch |
| 11 | Screw, H154, Slothead, 4-40 x 1/8-inch | 41 | Radial bearing, MP105, 1/4-inch |
| 12 | Screw, H154, Slothead, 4-40 x 1/8-inch | 42 | Radial bearing, MP105, 1/4-inch |
| 13 | Radial bearing MP104, 3/16-inch | 43 | Radial bearing, MP105, 1/4-inch |
| 14 | Radial bearing MP104, 3/16-inch | 44 | Radial bearing, MP105, 1/4-inch |
| 15 | Radial bearing MP104, 3/16-inch | 45 | 40-tooth gear MP903 |
| 16 | Radial bearing MP104, 3/16-inch | 46 | 50-tooth gear MP908 |
| 17 | Radial bearing MP104, 3/16-inch | 47 | 74-tooth gear MP911 |
| 18 | Radial bearing MP104, 3/16-inch | 48 | 80-tooth gear MP912 |
| 19 | Radial bearing MP104, 3/16-inch | 49 | 80-tooth idler |
| 20 | Radial bearing MP104, 3/16-inch | 50 | 80-tooth gear MP912 |
| 21 | Radial bearing MP104, 3/16-inch | 51 | 99-tooth idler |
| 22 | Radial bearing MP104, 3/16-inch | 52 | 99-tooth gear MP910 |
| 23 | Radial bearing MP104, 3/16-inch | 53 | 20-tooth gear MP905 |
| 24 | Radial bearing MP104, 3/16-inch | 54 | 80-tooth gear MP912 |
| 25 | Radial bearing MP104, 3/16-inch | 55 | 20-tooth gear MP904 |
| 26 | Radial bearing MP104, 3/16-inch | 56 | 50-tooth gear MP908 |
| 27 | Radial bearing MP104, 3/16-inch | 57 | 50-tooth gear MP909 |
| 28 | Radial bearing MP104, 3/16-inch | 58 | 50-tooth gear MP908 |
| 29 | Radial bearing, MP105, 1/4-inch | 59 | 20-tooth gear MP906 |
| 30 | Radial bearing, MP105, 1/4-inch | | |

Figure 4-42. RF subchassis gear train, exploded view.



TM5821-244-35-C4-III

Figure 4-43. RF power amplifier module mechanical assembly, exploded view.

- (3) Again hold up on the slug rack and install the left-hand cam (8) over the drive shaft (end opposite the driver end). Place the cam-locking collar over the shaft (flush against the cam) and tighten the four setscrews (3).
- (4) See that the rotor and stator blades of the variable capacitor are fully meshed when the cam follower rods are resting in the cam valleys. If the blades are not fully meshed, loosen the setscrews in the two cam-locking collars and rotate the drive shaft for proper alignment of rotor and stator blades. Then tighten the setscrews.

c. Removal of Slug Rack.

- (1) Remove the four screws (10) that hold the bumper (11) to the variable capacitor assembly (21). Remove the bumper.
- (2) Remove the two rack retaining rings (12) from the slug rack (9).
- (3) Lift the slug rack (with slugs attached) away from the variable capacitor assembly.

d. Replacement of Slug Rack.

- (1) Place the slug rack in position so that the round ends of the cam follower rods (5 and 6) fit into the holes in the slug rack, and the slugs fit into the coils on the variable capacitor assembly (21).
- (2) Secure the slug rack in position with two rack-retaining rings (12).
- (3) Install the bumper (11) over the slug rack and secure it with the four screws (10).

e. Removal of Cam Follower Rods.

- (1) Remove the follower retaining ring (13 or 18).
- (2) Remove the slug rack (*c* above); the follower rod and cam follower spring (14 or 17) will now fall out.

f. Replacement of Cam Follower Rods. To replace the cam follower rods, proceed as follows:

- (1) Place the cam follower spring (14 or 17) in position and insert the cam follower rod (5 or 6) from the top of the capacitor assembly.
- (2) Secure the cam follower rod with the follower retaining ring (13 or 18).
- (3) Replace the slug rack (*d* above).

4-27. Mechanical Drive Module Repairs

(fig. 4-44)

Replaceable parts of the mechanical drive module include the three diodes, the lamp, both switch assemblies, the motor, the reducer gear assembly, relay K703, the dials, and the mechanical drive assembly. These assemblies are not repairable and should be replaced as complete assemblies. Figure 4-44 shows these parts in exploded view. Subparagraphs *a* through *l* below explain removal and replacement of these parts.

Note. The reducer gear is a sealed unit, permanently lubricated. Do not attempt to repair or lubricate this unit.

a. Removal of Dials. To remove either the kilocycles or megacycles dial, remove the Phillips panhead screw, lockwasher, and flatwasher (1, 2, and 3, respectively, fig. 4-44) and slip the dial off the associated switch shaft.

b. Replacement of Dials. To replace the kilocycles or megacycles dial (5 or 4, respectively), proceed as follows:

- (1) Orient the kilocycles dial (5) so that the figures .00 align with the dial marker (7). Orient the megacycles dial so that the figures 30 align with the dial marker (7).
- (2) Install the dials over the switch shafts (with the megacycles dial at the bottom) and secure each with a Phillips panhead screw, a lockwasher, and a flatwasher (1, 2, and 3).
- (3) If the dials are not aligned with the markers ((1) above) loosen the marker screws (6) slightly and position the marker for proper alignment.

c. Removal of Megacycles Switch S701.

- (1) Remove the dials (*a* above).
- (2) Remove the four Phillips panhead screws (10, fig. 98) that hold the front of the reducer gear (12) to the front support assembly (11). Remove the support assembly.
- (3) Unsolder and tag each wire that connects to the megacycles switch (13).

Note. The hexagonal posts and dials will be left in the unit; do not unsolder leads from the diodes.

- (4) Loosen the two setscrews (14) in the locking collar (15) at the rear of the switch assembly.

assembly (11) and remove the support assembly.

- (3) Remove the two 1-inch Phillips panhead screws (22), which hold the drive motor (21) to the reducer gear assembly.
- (4) Remove the $\frac{1}{4}$ -inch Phillips panhead screw (23) and the 1-inch Phillips panhead screw (44) that hold the reducer gear assembly to the drive assembly (24).
- (5) Hold the drive motor with one hand while pulling the reducer gear assembly straight forward (away from the drive assembly) to disengage the motor from the reducer gear assembly and the reducer gear assembly from the drive assembly.

j. Replacement of Reducer Gear Assembly.

- (1) Apply a thin layer of grease (GL) or equivalent to the drive motor pinion and insert the pinion into the reducer gear assembly (12).
- (2) Secure the drive motor to the reducer gear assembly with two 1-inch Phillips panhead screws (22).
- (3) Position the reducer gear assembly so that the alignment locating button (25) on the drive assembly mates with the alignment hole in the rear of the reducer gear assembly and the exposed gears of the reducer gear assembly mesh with the gears on the drive assembly.

- (4) Secure the reducer gear assembly to the drive assembly (24) with the $\frac{1}{4}$ -inch Phillips panhead screw (23) and the 1-inch Phillips panhead screw (44).
- (5) Secure the reducer gear assembly to the front support assembly (11) with four $\frac{3}{8}$ -inch Phillips panhead screws (10).
- (6) Replace the dials (*b* above).

k. Removal of Drive Assembly.

- (1) Remove the terminal lug (28) from the lower left-hand corner of the drive assembly (24).
- (2) Remove the two 4-40 hexagonal nuts (29) that hold relay K703 (30) to the drive assembly. Leave the relay hanging by its wires.
- (3) Unsolder the wires from the terminals of solenoids K701 and K702 (32 and 33) on the drive assembly. Tag the wires.
- (4) Remove the two $\frac{7}{16}$ -inch Phillips panhead screws and hexagonal nuts (34 and 35, respectively) that hold connector P701 (36) to the drive assembly and lift the connector up to allow removal of the drive assembly.
- (5) Loosen the two setscrews (14) in the locking collar (15) on the rear of the megacycles switch (13).
- (6) Loosen the two setscrews (18) in the lock-

- 1 Screw H193, Phillips panhead, 2-56 x $\frac{1}{4}$ -inch
- 2 Lockwasher H244, No. 2
- 3 Flat washer H101, No. 8
- 4 Megacycles dial
- 5 Kilocycles dial
- 6 Screw H193, Phillips panhead, 2-56 x $\frac{1}{4}$ -inch
- 7 Dial marker
- 8 Flat washer H101, No. 8
- 9 Hexagonal nut H138, 2-56
- 10 Screw, Phillips panhead, 4-40 x $\frac{3}{8}$ -inch
- 11 Support assembly
- 12 Reducer gear assembly
- 13 Megacycles switch S701, wafer
- 14 Setscrew H150, 4-40 x $\frac{1}{8}$ -inch
- 15 Switch collar
- 16 Hexagonal spacing post
- 17 Kilocycles switch S702, wafer
- 18 Setscrew H150, 4-40 x $\frac{1}{8}$ -inch
- 19 Switch collar
- 20 Hexagonal spacing post
- 21 Motor B701
- 22 Screw H263, Phillips panhead, 2-56 x 1-inch
- 23 Screw H215, Phillips panhead, 4-40 x $\frac{1}{4}$ -inch

- 24 Drive assembly
- 25 Locating button
- 26 Screw H215, Phillips panhead, 4-40 x $\frac{1}{4}$ -inch
- 27 No. 4 lockwasher H232
- 28 Terminal lug
- 29 Hexagonal nut H142, 4-40
- 30 Relay K703
- 31 Staked bracket
- 32 Solenoid K702
- 33 Solenoid K701
- 34 Screw H204, Phillips panhead, 4-40 x $\frac{7}{16}$ -inch
- 35 Hexagonal nut H142, 4-40
- 36 Connector P701
- 37 Screw H215, Phillips panhead, 4-40 x $\frac{1}{4}$ -inch
- 38 Screw H215, Phillips panhead, 4-40 x $\frac{1}{4}$ -inch
- 39 Neon lamp DS101
- 40 Diode CR703
- 41 Diode CR702
- 42 Diode CR701
- 43 No. 2 lockwasher
- 44 Screw H209, Phillips panhead, 4-40 x 1-inch

Figure 4-44. Mechanical drive module, exploded view.

ing collar (19) on the rear of the kilocycles switch (17).

- (7) Remove the 1/4-inch Phillips panhead screw (23) and the 1-inch Phillips panhead screw (44) that hold the rear of the reducer gear assembly (12) to the drive assembly.
- (8) Remove the two 1/4-inch Phillips panhead screws (37) that hold the megacycles switch hexagonal spacing posts (16) to the drive assembly and the two 1/4-inch Phillips panhead screws (38) that hold the kilocycles switch hexagonal spacing posts (20) to the drive assembly. Remove the drive assembly by pulling it from the rear.

1. Replacement of Drive Assembly.

- (1) Place the drive assembly (24) in position so that the gears mesh with the exposed gear of the reducer gear assembly (12) and the alignment locating button (25) fits into the alignment hole in the reducer gear assembly.
- (2) Secure the drive assembly to the rear of the reducer gear assembly with the 1/4-inch Phillips panhead screw (23) and the 1-inch Phillips panhead screw (44).
- (3) Secure the drive assembly to the megacycles and kilocycles switch hexagonal posts (16 and 20) with four 1/4-inch Phillips panhead screws (37 and 38).
- (4) Tighten the setscrews (14 and 18) in the switch locking collars (15 and 19).
- (5) Secure relay K703, the staked bracket, and lamp DS701 (30, 31, and 39) to the drive assembly with two 4-40 hexagonal nuts (29).
- (6) Secure connector P701 (36) to the drive assembly with two 7/16-inch Phillips panhead screws (34) and two 4-40 hexagonal nuts (35).
- (7) Secure the terminal lug (28) to the lower left-hand corner of the drive assembly with a 1/4-inch Phillips panhead screw and a No. 4 lockwasher (26 and 27).
- (8) Solder the two loose wires to solenoids K701 and K702 (32 and 33) and remove the tags from the wires.

4-28. RF Amplifier Module Repairs

The RF amplifier module variable capacitor assembly is not repairable and should be replaced as a unit. The rest of the module consists of one printed circuit board assembly and six electronic component plate assemblies. Refer to paragraph 4-23 for general instructions for removal and replacement of electronic parts. It is often practical to replace whole plate assemblies and repair the plate assembly later. The procedure for removing the plate assemblies is obvious. Be sure to tag unsoldered wires to insure proper reassembly. It is best to unsolder RF cables at the circuit board because RF connectors are difficult to replace.

4-29. Variable IF Module Repairs

(fig. 4-45)

The variable IF module has six slug-tuned coils. The slugs are attached to a slug rack, which is driven by a pair of matched cams. The drive shaft, which is driven by the RF subchassis gear train, drives the cams. The drive shaft also drives a secondary gear train, which, in turn, drives the low-frequency oscillator module. The slug rack and the coil assembly are shown separately in figure 4-45; however, if a coil assembly or a slug rack is replaced, the module must be realigned in accordance with paragraph 3-19. The cams are a matched pair and must be replaced with a matched pair. Other replaceable mechanical parts (fig. 4-45) include gears, bearings, and springs. Subparagraphs *a* through *h* below explain the removal and replacement of these parts.

a. Removal of Slug Rack.

- (1) Unsolder the wires between the printed circuit board assemblies (1, 2, and 3, fig. 4-45) and pull the boards away from the chassis as necessary for clearance of the slug rack assembly (4).
- (2) Unfasten the two coil springs (5) from the slug rack assembly and pull the slug rack assembly (with slugs attached) away from the chassis (28), withdrawing the slugs from the coils in the chassis.
- (3) If the ball bushings (6) are to be replaced, remove the retaining rings (7 and 8) from above and below the bushings. The bushings will now fall out of the slug rack.

g. Removal of Rotary Switch S101A. To remove S101A, perform the procedures given in *e* above, and then unsolder the capacitors from the switch contacts. (Read the caution given in paragraph 4-31.) Tag the capacitor leads to aid in locating the proper contacts when replacing the switch.

h. Replacement of Rotary Switch S101A. To replace S101A, solder the capacitors (mounted on the grounding ring) to the proper contacts of S101A. (Read the caution given in paragraph 4-31.) If the capacitors are not tagged, refer to the wiring diagram (fig. 6-28) for proper connection. Next perform the procedures in *f* above.

i. Removal of Rotary Switch S103C. Procedures for removing S103C are identical with the procedures for removing S101A (*g* above).

j. Replacement of Rotary Switch S103C. Procedures for replacement of S103C are identical with the procedures for replacing S101B (*f* above), except that the keying notch should face the rear (end opposite motor) of the antenna coupler, and the connector bracket (24) should be installed over the switch with two No. 3 spacers and two flat washers (26 and 23, respectively). After installing the bracket, check the connector (22, fig. 6-29); it should move freely in a lateral plane.

k. Removal of Rotary Switch S103B. Procedures for removing S103B are identical with the procedures for removing S101A (*g* above).

l. Replacement of Rotary Switch S103B. Procedures for replacing S103B are identical with the procedures for replacing S101A (*h* above), except as noted in *j* above.

m. Removal of Motor Assembly B101.

- (1) Unsolder the two wires from the end of the motor.
- (2) Remove the two self-locking nuts and flat washers (43 and 44, respectively) from the clamp (45) and remove the clamp.
- (3) Remove the four motor-mounting screws and lockwashers (48 and 49, respectively). Remove the motor assembly.

n. Replacement of Motor Assembly B101. Perform the following steps to replace the motor assembly:

- (1) Select the shim (50) that allows full mesh of the motor bevel gear with the bevel gear on shaft assembly No. 1 (92)

and install it between the motor assembly and the spacer block (51).

- (2) Secure the motor assembly and shim in place with four 4-40 x $\frac{1}{16}$ -inch Phillips panhead screws and four lockwashers (48 and 49). The nameplate on the motor assembly should face the left side of the antenna coupler (looking from the motor end).
- (3) Secure motor clamp, spacer, and motor (45, 46, and 47, respectively) to the lower bearing plate (99) with two 4-40 x $\frac{1}{16}$ -inch Phillips panhead screws, two self-locking nuts, and two flat washers (110, 43, and 44).
- (4) Solder the two loose wires (extending from the relay (33)) to the terminals on the end of the motor. The terminals are color-coded. (Connect the white-brown-blue wire to the black terminal and the white-black-blue wire to the red terminal.)

o. Removal of Relay K101.

- (1) Remove the lacing cord from the relay.
- (2) Unsolder and tag all wires from the relay. Unsolder the two capacitors (34 and 35).
- (3) Remove the two hexagonal nuts (39 and 42), the two lockwashers (38 and 41), the flat washer (40), and the solderless terminal (37) and remove the relay.

p. Replacement of Relay K101.

- (1) Mount the relay to the front of the upper bearing plate (36) with the identification up. Secure the relay with two hexagonal nuts, two lockwashers, one flat washer, and the solderless terminal (39 and 42, 38 and 41, 40 and 37, respectively).
- (2) Solder both capacitors (34 and 35) to the relay terminals (fig. 6-28).
- (3) Solder all loose wires to the relay terminals (fig. 6-28).
- (4) Fold the two capacitors over so that they rest on the side of the relay. Tie the capacitors and wiring to the relay with lacing cord.

q. Removal of Electrical Connector J101. To remove J101, remove the four screws (107 and 108). Slide the connector (106) out of the bearing plate (99), and unsolder and tag all wires.

r. Replacement of Electrical Connector J101. To replace J101, solder all the wires to the proper terminals. If not tagged, use the wiring diagram (fig. 6-30) and then slide the connector into position on the bearing plate (99). Secure the connector to the bearing plate with two 4-40 x 1/4-inch Phillips panhead screws and two 4-40 x 3/16-inch Phillips panhead screws (108 and 107).

CAUTION:

The shorter screws go in the holes nearest the bearings and the longer screws go in the holes nearest the edge of the bearing plate. If screws longer than 3/16-inch long are put in the holes near the bearings, the screws will bind against the gears and lock the gear train and damage to the motor will result when the unit is operated.

s. Removal of Lower Bearings.

NOTE

In newer units, items 109 and 99 (mounting plates) are riveted together; however, bearings can be pushed out as in (7) below.

(1) Remove all the screws from the mounting plate (109) and remove the mounting plate.

(2) Remove the four Phillips panhead screws (107 and 108) from the power connector and slide the connector out of the lower bearing plate (99).

(3) Remove the four Phillips flathead screws (103) that hold the lower bearing plate to the hexagonal posts.

(4) Remove four Phillips panhead screws (104 and 105) that hold the lower bearing plate to the front and rear spacers.

(5) Unsolder the wire from the RF connector (100).

(6) Remove the lower bearing plate; be careful that shaft assemblies No. 2 and No. 3 (93 and 94) do not drop down and damage the two wafer switches (86 and 87).

(7) Push the bearings (95, 96, and 97) out of the bearing plate by exerting pressure from the bottom of the plate.

t. Replacement of Lower Bearings. Perform the following steps to replace the lower bearings:

(1) Press the bearings (95, 96, and 97) into the lower bearing plate (99) from the top of the plate (the side with the nut plates).

(2) If shaft assemblies No. 2 and No. 3 (93 and 94) have been allowed to drop down and become unmeshed, align them so that the scribe marks on the gears line up; then push the shafts into the upper bearing plate to mesh the gears.

(3) Place the lower bearing plate (99) in position and secure it to the four hexagonal posts (98) with four 4-40 x 1/4-inch Phillips flathead screws (103).

(4) Solder the loose wire to the RF connector terminal (100).

(5) Slide the electrical connector (106) into its mounting hole in the lower bearing plate and secure it with two 4-40 x 1/4-inch Phillips panhead screws (108) and two 4-40 x 3/16-inch Phillips panhead screws (107).

NOTE

Be sure that the two shorter screws are installed nearest the bearings; the longer screws, if installed here, will bind against the gears.

(6) Mount the mounting plate (109) to the lower bearing plate with six 4-40 x 3/16-inch Phillips flathead screws (55 and 112).

(7) Slide the motor spacer (46) under the motor and install the motor clamp (45) over the motor. Secure with two 4-40 x 7/16-inch Phillips panhead screws, two flat washers, and two self-locking nuts (1110, 44, and 43).

(8) Secure the bottom of the rear spacer (51) with two 4-40 x 5/16-inch Phillips panhead screws (105).

(9) Secure the bottom of the front spacer (52) with two 4-40 x 5/16-inch Phillips panhead screws (104).

u. Removal of Megacycle Seeking Switch S103A.

(1) Perform all the procedures given in *s* above except step (7).

(2) Unsolder and tag all wires that connect to contacts of S103A (86).

(3) Remove the two self-locking nuts and flat washers (69 and 68) that hold the switch to the upper bearing plate and then remove the switch.

(4) Remove the retaining ring (77) from shaft assembly No. 3 (94) and remove the shaft assembly.

v. Replacement of Megacycle Seeking Switch S103A.

(1) Solder the loose wires to the switch contacts being careful not to break the switch contacts (fig. 6-28).

(2) Replace the shaft assembly (94), aligning it so that the scribe mark on the gear aligns with the scribe mark on the large gear.

(3) Mount the switch to the upper bearing plate (36); use the two 5-40 x 2-inch screws that extend through S101C and S101B, two No. 2 spacers (71), two self-locking nuts (90) and two flat washers (91).

(4) Complete the assembly by performing the procedures given in *t*(3) through (9) above.

w. Removal of Ambiguity Switch S102A.

(1) Perform all the procedures given in *s* above except step (7).

(2) Unsolder and tag all wires that connect to S102A (87).

(3) Remove the two self-locking nuts and flat washers (88 and 89) that hold the switch to the upper bearing plate and remove the switch.

(4) Remove the retaining ring (76) from shaft assembly No. 2 (93) and remove the shaft assembly.

x. Replacement of Ambiguity Switch S102A.

(1) Solder the loose wires to the switch contacts; be careful not to break the contacts. (Refer to the wiring diagram (fig. 6-28) if necessary.)

(2) Replace the shaft assembly (93), aligning the gear so that the scribe marks align with the scribe marks on the adjoining gears.

(3) Mount the switch to the upper bearing plate (36); use two 5-40 x 7/8-inch Phillips panhead screws and flat washers (57 and 58), two No. 4 spacers (72), and two self-locking nuts and flat washers (88 and 89). (Leave the nuts slightly loose for adjustment of the switch after the gear plates are reassembled.)

NOTE

The large gear has a scribe mark centered on a gear tooth and, across from it, a scribe mark

centered between two teeth. When the gears are properly aligned, the marked gear tooth will align with the mark on the gear nearest the motor and the other mark will align with the mark on the gear farthest from the motor.

(4) Complete the assembly by performing the procedures given in *t* (3) through (9) above.

(5) Rotate S102A (87) in its slotted mounting holes as necessary to cause contact 7 of the switch to make contact with the switch rotary contact while contact 17 does not make contact with the rotary contact. (Use the two inspection holes that are provided in the upper bearing plate under S102B.)

NOTE

If this adjustment requires offcentering of the switch-mounting screws in the slotted holes, make sure that both screws (57) are off-centered by the same amount so that the switch wafer will not be warped when the mounting nuts are tightened.

(6) Tighten the two self-locking nuts (88).

y. Removal of Shaft Assemblies.

(1) Perform the procedures given in *s* (1) through (5) above.

(2) If shaft assembly No. 2 or No. 3 (93 or 94) is to be removed, remove the applicable retaining ring (76 or 77) and slide the shaft assembly out.

(3) If shaft assembly No. 1 (92) is to be removed, loosen the four motor mounting screws (48) and slide the motor out far enough to disengage the bevel gears to allow removal of the shaft assembly.

z. Replacement of Shaft Assemblies.

(1) Insert shaft assemblies No. 2 and No. 3 (93 and 94) through their respective switches. Slide one flat washer (74 or 75) and one curved spring washer (84 or 83) over each shaft assembly. Install the retaining rings (76 and 77). Install the spring washers so that the curved sides will press against the bearing inner race as shown in figure 6-29.

(2) Insert all three shaft assemblies into the upper gear plate with the gears aligned so that all the scribe marks line up (*x*(3) above).

(3) Mesh the bevel gear on shaft assembly No. 1 with the motor bevel gear by sliding the

motor in place and tightening the four motor mounting screws (48). If shaft assembly No. 1 has been replaced, check to see that the motor shim allows full mesh of bevel gears. If not, use a different-thickness shim. (Four different shims are provided with each motor assembly.)

NOTE

If the bevel gears do not mate properly with all the scribe marks aligned, the gears may be rotated slightly to achieve proper mesh. If rotary switches S102A and S102B have not been removed, the switch adjustment will not be affected.

(4) Complete the assembly by performing the procedures given in *t*(3) through (9) above.

aa. Removal of Upper Bearings.

(1) Remove the shaft assemblies (*y* above).

(2) Slide the bearings (80, 81, and 82) out of the upper bearing plate. (Bearings are pressed in from the gear side of the plate.)

ab. Replacement of Upper Bearings.

(1) Press the bearings (80, 81, and 82) into the upper bearing plate (36) from the gear side.

(2) Replace the shaft assemblies and complete the assembly of the antenna coupler by performing the procedures given in *z* above.

Section III. MODULE ADJUSTMENTS

4-33. General

This section (paras 4-33 through 4-38) contains instructions for performing all electrical adjustments on all main chassis modules. Refer to paragraphs 3-14 through 3-21 for alignment of rf subchassis modules.

4-34. Sel-Call Module Adjustments

Make the following adjustments on the sel-call module; use the module tester (AN/ARM-87) and standard test equipment as shown in figure 4-26. Module Extender MX-4934/ARC-54 is part of Maintenance Kit, Electronic Equipment MK-733/ARC-54.

a. Preliminary Adjustments. Make the following preliminary adjustments, using the ME-26B/U, with no power applied to the module:

(1) Adjust R108 for a reading of 750 ohms between test point 6 and test point 7 on the module.

(2) Adjust R110 for a reading of 700 ohms between test point 2 and test point 3 on the module.

(3) Adjust R112 for a reading of 250 ohms between test point 4 and test point 5 on the module.

b. Tone Amplifier Adjustment. With the test setups shown in figure 4-26, make the following adjustments:

(1) Set up the CIRCUIT SELECTOR switches for program 3341 and apply power to the module.

(2) Set up the audio oscillator for an output level of 14.5 ± 0.5 millivolt at 145 ± 0.5 cps at the base of Q102 as measured on the ME-30B/U and the AN/USM-26.

(3) Adjust R110 for a reading of 1 ± 0.1 volt at pin 8.

(4) Tune the audio oscillator to 155 ± 0.5 cps at the same level as above and adjust R112 for a reading of 1 ± 0.1 volt at pin 8.

c. Tone Oscillator Adjustment.

(1) Set up the CIRCUIT SELECTOR switches for program 2X36 (X indicates that any setting is satisfactory).

(2) Remove the audio oscillator from the test setup and move the frequency meter input to pin 8.

(3) Measure the frequency at pin 8. If the frequency is not 150 ± 1 cps, adjust R108.

4-35. Homer Module Adjustments

Make the following adjustments on the homer module; use the module tester and standard test equipment. Do not use a test adapter for homer module adjustments; plug the module directly into the module tester.

a. 500-Kc Amplifier Adjustment.

(1) Set the CIRCUIT SELECTOR switches for program 6934 and, while holding the meter PRESS TO TEST button down,

adjust the 500KC AMPL controls for a reading of 68 percent on the TEST METER.

(2) Use an RF voltmeter to measure the voltage at test point 1 on the module, and adjust L204 and L205 for maximum indication.

b. Signal Strength Amplifier (Over Target) Adjustment. Set the CIRCUIT SELECTOR switches for program 8XXX and, while holding the meter PRESS TO TEST button down, adjust R211 for a meter indication of 65 percent.

c. Homer Course Adjustment.

(1) Set the CIRCUIT SELECTOR switches for program 7943.

(2) Adjust R227 for a reading of zero on the meter. (Hold of the PRESS TO TEST button down for the reading.)

(3) Set the CIRCUIT SELECTOR switches for program 6934.

(4) Adjust the 500KC AMPL control on the module tester for a reading of 56 percent on the meter.

(5) Set the CIRCUIT SELECTOR switches for program 7944.

(6) Hold the PRESS TO TEST button down and adjust R224 on the module for a reading of 24 percent on the meter.

(7) Change the program to 7834 and check for reading of 24 ± 3 percent.

4-36. Fixed IF Module Adjustment

Plug the module into the module tester (AN/ARM-87), apply power to the tester, and adjust L1205 as follows:

a. Set the module tester CIRCUIT SELECTOR switches for program 3685 and adjust the 500KC AMPL control for a reading of 64 percent on the meter.

b. Set the module tester CIRCUIT SELECTOR switches for program 3665 and adjust the 1KC AMPL control for a reading of 74 percent on the meter.

c. Set the module tester CIRCUIT SELECTOR switches for program 3315 and

adjust the DIST DET control for a reading of 55 percent on the meter.

d. Set the module tester CIRCUIT SELECTOR switches for program 3305 and adjust L1205 on the fixed IF module for minimum reading on the test meter. If meter reads off-scale, adjust DIST DET setting for on-scale reading, then tune L1205 for minimum reading.

4-37. Receive Audio Module Adjustments

Make the following adjustments on the receive audio module; use the module tester (AN/ARM-87) and standard test equipment as shown in figure 4-29.

a. Gain Adjustment.

(1) Set the module tester CIRCUIT SELECTOR switches for program 5760 and adjust the 1KC AMPL control for a reading of 95 percent on the module tester meter. (Hold the PRESS TO TEST button down for reading.)

(2) Measure the ac voltage level from pin 14 to ground on the test adapter and adjust R1315 (GAIN) on the module for 2.73 volts rms.

b. Squelch Adjustment.

(1) Set the module tester CIRCUIT SELECTOR switches for program 5760 and adjust the 1KC AMPL control for a reading of 95 percent on the module TEST METER.

(2) Change the CIRCUIT SELECTOR switches to program 6061 and adjust the 150 CPS AMPL control for a reading of 1 volt rms (use external voltmeter) between pin 8 and ground on the test adapter.

(3) Press the PRESS TO TEST button and adjust R1332 (SQUELCH) on the module counterclockwise until the voltmeter reading just drops to zero. Rotate R1332 clockwise until the meter reading increases suddenly.

(4) Rotate the 150 CPS AMPL control on the module tester counterclockwise (holding the PRESS TO TEST button down) until the module tester meter reading decreases sharply.

(5) Measure the ac voltage at pin 8 of the test adapter. The voltage should not be less than 0.78 volt rms.

4-38. Transmit Audio Module Adjustments

Make the following adjustments on the transmit audio module; use the module tester (AN/ARM-87) and standard test equipment as shown in figure 4-32. The test adapter shown is part of Maintenance Kit, Electronic Equipment MK-733/ARC-54.

a. Oscillator Adjustment.

(1) Adjust L1401 on the module until the core adjustment screw is even with the top of the coil form.

(2) Set up the CIRCUIT SELECTOR switches on the module tester for program 4675.

(3) Use the AN/USM-26 (or equivalent) with a high-impedance probe and measure the frequency at J1402 on the module. Adjust L1401 for a frequency of $500\text{KC} \pm 100 \text{ cps}$.

(4) Disconnect the frequency meter.

b. Audio Adjustment.

(1) Set up the CIRCUIT SELECTOR switches on the module tester for program 3664.

(2) Adjust the 1KC AMPL control for a reading on the module tester meter of 53 percent.

(3) Set up the CIRCUIT SELECTOR switches for program 3624, and adjust R1402 (AUDIO) on the module for a reading of 75 percent on the TEST METER.

c. Sidetone Adjustment.

(1) With the 1KC AMPL control set as in b(2) above, set up the CIRCUIT SELECTOR switches on the module tester for program 3673.

(2) Adjust R1413 (SIDETONE) on the module for a reading of 55 percent on the TEST METER.

d. Tone Adjustment.

(1) Set up the CIRCUIT SELECTOR switches on the module tester for program 3541.

(2) Adjust the 150 CPS AMPL control for 92 percent on the TEST METER.

(3) Change the CIRCUIT SELECTOR switches to program 3521.

(4) Adjust TONE DEV (R1436) for 24 percent on the TEST METER.

CHAPTER 5

GENERAL SUPPORT AND DEPOT TESTING PROCEDURES

Section I. INTRODUCTION

5-1. General

a. Testing procedures are prepared for use by Signal field maintenance shops and Signal service organizations responsible for general support maintenance of signal equipment to determine the acceptability of repaired signal equipment (RT-348/ARC-54, C-3835/ARC-54, and CU-942/ARC-54 (or CU-943/ARC-54)). These procedures set forth specific requirements that repaired signal equipment must meet before it is returned to the using organization. The testing procedures may also be used as a guide for the testing of equipment that has been repaired by the direct support repairman if the proper tools and test equipment are available. A summary of the test data is given in paragraphs 5-24, 5-25, and 5-26.

b. Comply with the instructions preceding the body of each chart before proceeding to the chart. Perform each test in sequence. Do not vary the sequence. For each step, perform all the actions required in the test equipment control settings columns; then perform each specific test procedure and verify it against its performance standard.

Caution

Make sure that test set jumpers are connected as shown in each test setup illustration. These jumpers connect the RF output of the receiver-transmitter to a dummy load in the test set. If the jumpers are not in place, the equipment could become damaged.

5-2. Test Equipment, Tools, and Materials Required

All test equipment, tools, materials, and other equipment required to perform the testing procedure given in this chapter are listed in the following charts and are authorized under TA 11-17 and TA 11-100 (11-17).

NOTE

Equivalent test equipment may be substituted for those listed.

a. Test Equipment.

Nomenclature	Federal stock No.	Technical manual
Maintenance Kit, Electronic Equipment MK-733/ARC-54 (two required for transmitter carrier noise test).		TM 11-6625-601-12
Modulation Meter ME-57/U		TM 11-6625-400-12
Audio Oscillator TS-382/U	6625-192-5094	
Signal Generator AN/URM-48		TM 11-1257
Electronic Voltmeter ME-30B/U.	6645-243-0562	TM 11-6625-320-12
Frequency Meter AN/USM-26 and Converter CV-394/USA-5.		TM 11-5057
Attenuator, Variable CN-796/U (2 each).		
Multimeter, Meter ME-26A/U.		TM 11-6625-200-12
Spectrum Analyzer TS-723A/U.		TM 11-5097
Radio Interference Measuring Set AN/URM-85.		TM 11-6625-351-12
Signal Generator AN/USM-44A.	6625-669-0258	TM 11-6625-508-10

Nomenclature	Federal stock No.	Technical manual
Admittance Meter, General Radio Model 1602B. Receiver-Transmitter, Radio RT-348/ARC-54 (required for transmitter carrier noise test). Oscilloscope AN/USM-81-----	6625-701-4038	TM 11-6625-219-12

b. Other Equipment.

Nomenclature	Federal stock No.	Technical manual
Dc power source: +27.5 $\pm$ 0.5 volts dc at 10 amperes with maximum ripple and noise of 200 millivolts. Headset-Microphone H-101/U. Stopwatch with second hand--- Capacitor 0.2 μ f.----- Toolkit, Radio Radar Repairman TK-87/U.	5965-296-2473 5180-690-4552	TM 11-5965-215-15

5-3. Test Facilities

A primary source of dc power capable of supplying +27.5 $\pm$ 0.5 volts at 10 amperes (mini-

mum) with noise and ripple not more than 200 millivolts is required to operate the equipment. Maintenance Kit, Electronic Equipment MK-733/ARC-54 may be used for testing the entire unit of an AN/ARC-54 or any individual unit separately. The test procedures are written so that the units may be tested individually, thereby fully utilizing the capabilities of the test equipment. The simulator (SM-349/ARC-54) may be removed from the main test unit TS-1967/ARC-54 for use for on-aircraft troubleshooting while performing tests on the RT-348/ARC-54 using the TS-1967/ARC-54. The simulator is required (in the main test unit) for control unit test only.

5-4. Modification Work Orders

The performance standards listed in the tests (paras 5-5 through 5-22) are based on the assumption that all applicable modification work orders have been performed. A listing of current modification work orders will be found in DA Pam 310-7.

Section II. GENERAL SUPPORT TESTING RECEIVER-TRANSMITTER, RADIO RT-348/ARC-54

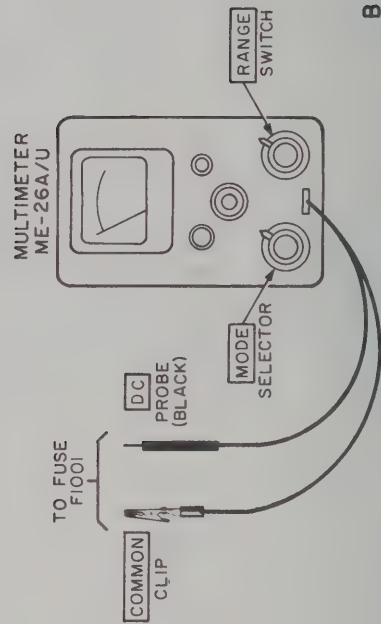
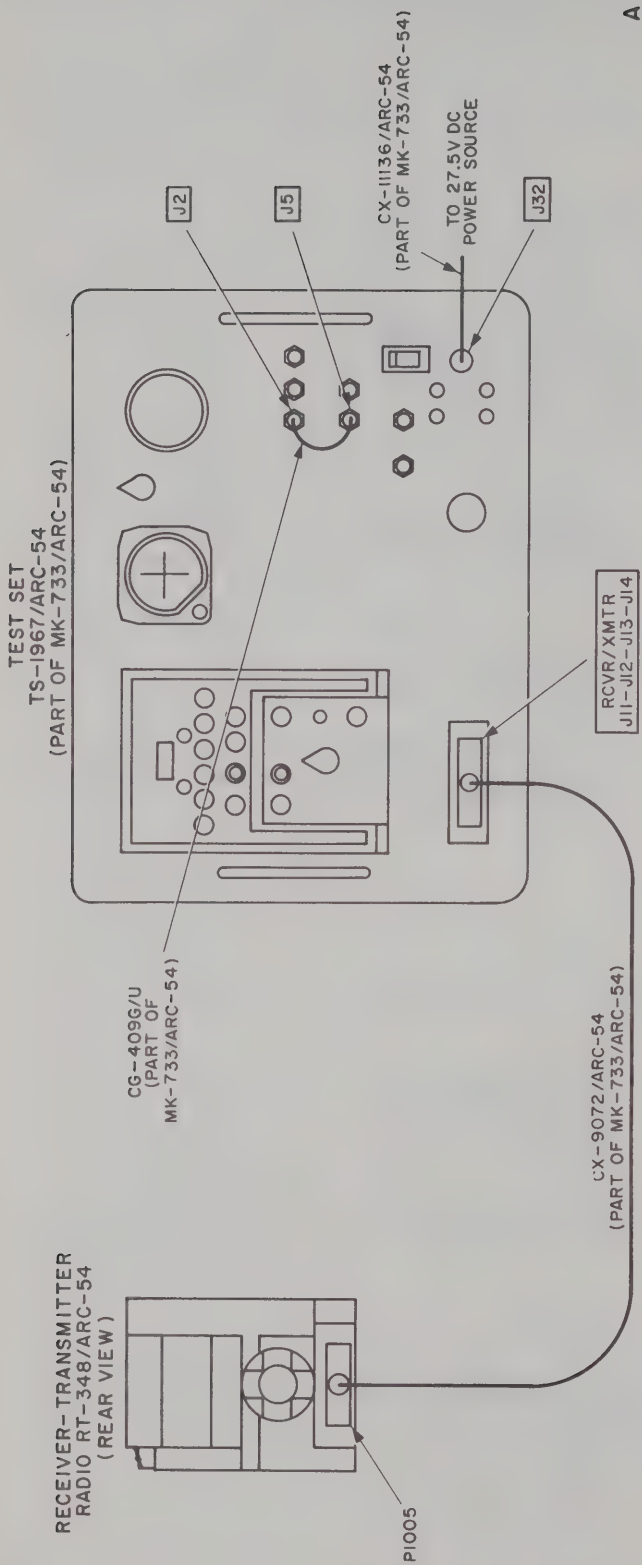
5-5. Physical Tests and Inspection

a. Test Equipment and Materials. None.

b. Test Connections and Conditions. None.

c. Procedure.

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	None.	None.	a. Inspect equipment covers and front panels for condition of finish and panel markings. <i>Note.</i> Touchup painting is recommended instead of complete refinishing whenever practical. Screwheads, receptacles, mounting screws, Dzus fasteners, and mounting should not be painted or polished with abrasives. b. Inspect for dents, punctures, or warped areas. c. Inspect springlock fasteners and receptacles. d. Inspect external surfaces for loose or missing screws or washers. e. Inspect receptacles for condition of pins, contacts, and mounting, for foreign particles. f. Inspect air filters and air outlet.	a. Exterior surfaces intended to be painted show no bare metal. Panel markings on legible. b. No dents, punctures, or warped areas are evident. c. Springlock receptacles are in good condition and secure the equipment and covers properly. d. All screws and washers are secure. e. All receptacles are tightly mounted. There are no bent, broken, or missing pins. Receptacle moldings are not chipped or cracked and no foreign particles are present. f. Air filters are clean and securely mounted. Air exhaust is clear.
2	None.	As required.	a. Operate all controls through all their positions. (Do not disturb screwdriver adjustments.) b. Operate receiver-transmitter unit locking handles. c. Inspect meter.	a. Controls operate smoothly with no binding. Control knobs are tight on their shafts. b. Locking handle operates smoothly and locking handle catch secures handle properly. c. Meter glass is clean and not damaged.
3	None.	None.	Inspect the equipment for applicable modification work orders (para 5-4).	All applicable modification work orders have been performed.



NOTE:
[] INDICATES EQUIPMENT MARKING.

TM5821-244-35-C4-47

Figure 5-1. Test meter test setup.

5-6. Test Meter Test and XMTR TEST Switch

a. Test equipment and Materials.

Maintenance Kit, Electronic Equipment MK-733/ARC-54.

Multimeter ME-26A/U.

Headset-Microphone H-101/U.

b. Test Connections and Conditions. Connect equipment as shown in figure 5-1.

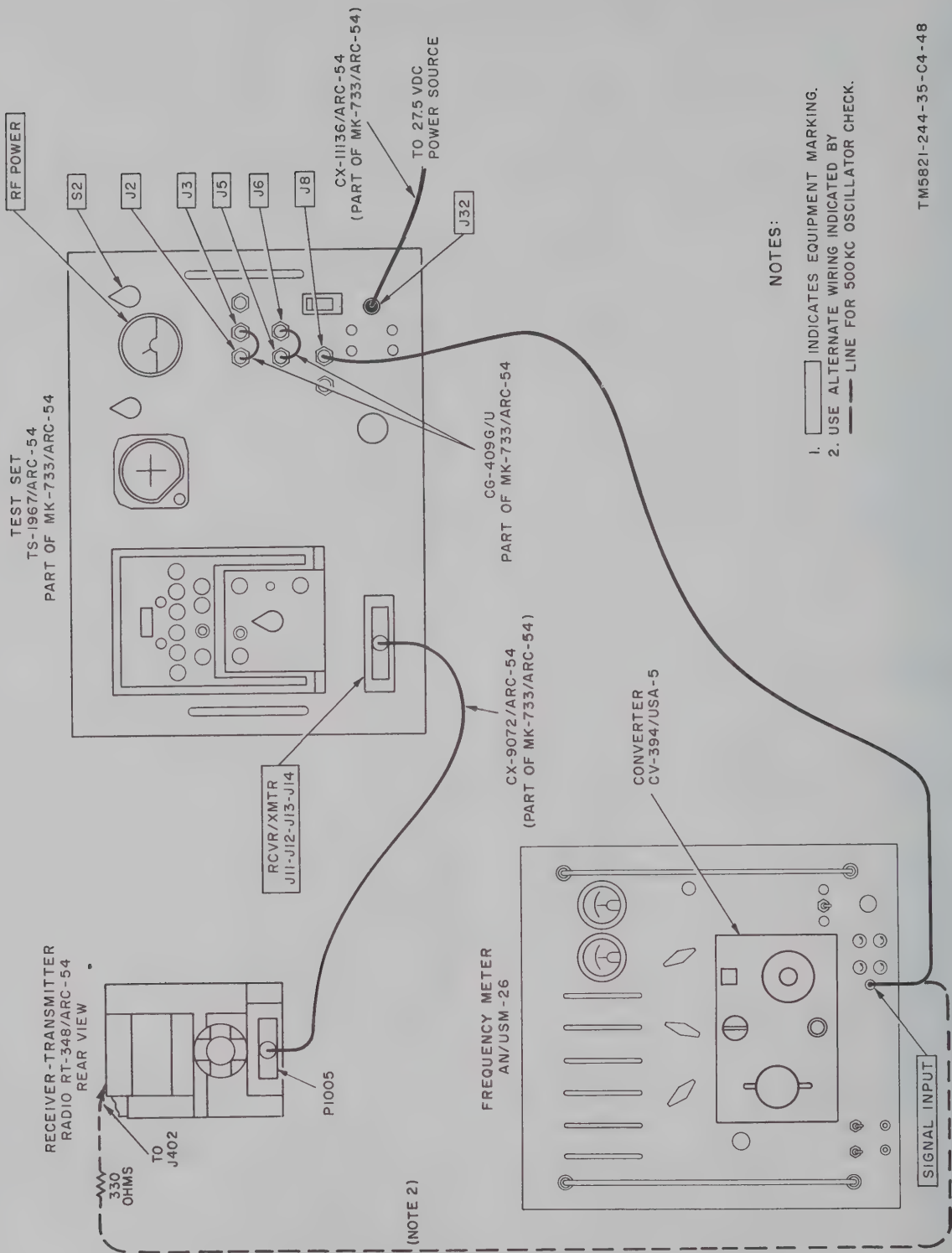
c. Procedure.

Step No.	Control settings		Test procedure	Performance standard																										
	Test equipment	Equipment under test																												
1	<i>TS-1967/ARC-54</i> S3: 30. S4: 0. S5: 0.95. S6: RCV. S7: CARR (set to TONE for position 5 test). S9: PTT. S10: RADIO. S11: TEST SET. All other switches: Any position. POWER circuit breaker: ON. <i>ME-26A/U</i> Mode selector: +. RANGE: 30 volts.	<i>RT-348/ARC-54</i> TEST SWITCH: Set as instructed in <i>Test procedure</i> column.	a. Make measurement with ME-26A/U DC probe at fuse F1001, and COMMON clip connected to RT-348/ARC-54 chassis. b. Beginning at position 1, successively select each position of the RT-348/ARC-54 TEST SWITCH and note the indication on the RT-348/ARC-54 TEST METER for each position. <i>Note.</i> Set S7 on the test set to TONE when checking position 5.	a. 27.5 volts dc. (Adjust power supply if necessary.) <i>Note.</i> Ammeter on power supply should not indicate more than 7.4 amperes for receiver and transmit condition tests. b. Observe the following: <table><thead><tr><th>Position</th><th>Reading</th></tr></thead><tbody><tr><td>1-----</td><td>50±30</td></tr><tr><td>2-----</td><td>50±30</td></tr><tr><td>3-----</td><td>50±30</td></tr><tr><td>4-----</td><td>50±30</td></tr><tr><td>5-----</td><td>NMT 20</td></tr><tr><td>6-----</td><td>50±30</td></tr><tr><td>7-----</td><td>NMT 5</td></tr><tr><td>8-----</td><td>NMT 5</td></tr><tr><td>9-----</td><td>NMT 5</td></tr><tr><td>10-----</td><td>NMT 5</td></tr><tr><td>11-----</td><td>NMT 5</td></tr><tr><td>12-----</td><td>0</td></tr></tbody></table> <i>Note.</i> A slight fluctuation of the test meter in each position is permissible.	Position	Reading	1-----	50±30	2-----	50±30	3-----	50±30	4-----	50±30	5-----	NMT 20	6-----	50±30	7-----	NMT 5	8-----	NMT 5	9-----	NMT 5	10-----	NMT 5	11-----	NMT 5	12-----	0
Position	Reading																													
1-----	50±30																													
2-----	50±30																													
3-----	50±30																													
4-----	50±30																													
5-----	NMT 20																													
6-----	50±30																													
7-----	NMT 5																													
8-----	NMT 5																													
9-----	NMT 5																													
10-----	NMT 5																													
11-----	NMT 5																													
12-----	0																													
<i>Note.</i> Admiral sets manufactured on order No. FR-043-P5-00690(E) contract No. DA-28-043-AMC-00470(E), position 11 shall indicate a reading when the transmitter is momentarily keyed with the antenna load disconnected.																														
2	<i>TS-1967/ARC-54</i> S3: 60. S4: 7. S5: 0.00. S6: RCV. S7: DIS. S9: PTT. S10: RADIO. S11: TEST SET. POWER circuit breaker: ON. All other switches: Any position.	<i>RT-348/ARC-54</i> TEST SWITCH: Set as instructed in <i>Test procedure</i> column.	a. Depress XMTR TEST switch on front panel of RT-348/ARC-54 and beginning at position 1, successively select each position of the RT-348/ARC-54 TEST SWITCH and observe the reading on the RT-348/ARC-54 TEST METER for each position. b. Remove the cable between J2 and J5 and momentarily depress XMTR TEST switch on front panel of RT-348/ARC-54.	a. Observe the following: <table><tbody><tr><td>1-----</td><td>50±30</td></tr><tr><td>2-----</td><td>50±30</td></tr><tr><td>3-----</td><td>50±30</td></tr><tr><td>4-----</td><td>50±30</td></tr><tr><td>5-----</td><td>50±30</td></tr><tr><td>6-----</td><td>50±30</td></tr><tr><td>7-----</td><td>NLT 5</td></tr><tr><td>8-----</td><td>NLT 20</td></tr><tr><td>9-----</td><td>50±30</td></tr><tr><td>10-----</td><td>NLT 20</td></tr><tr><td>11-----</td><td>NMT 10</td></tr></tbody></table> <i>Note.</i> A slight fluctuation of the test meter in each position is permissible. b. The reading for position 11 should be 50±30.	1-----	50±30	2-----	50±30	3-----	50±30	4-----	50±30	5-----	50±30	6-----	50±30	7-----	NLT 5	8-----	NLT 20	9-----	50±30	10-----	NLT 20	11-----	NMT 10				
1-----	50±30																													
2-----	50±30																													
3-----	50±30																													
4-----	50±30																													
5-----	50±30																													
6-----	50±30																													
7-----	NLT 5																													
8-----	NLT 20																													
9-----	50±30																													
10-----	NLT 20																													
11-----	NMT 10																													

Notes.

1. NMT = Not more than.

2. NLT = Not less than.



TM5821-244-35-C4-48

Figure 5-2. Transmitter power output test setup.

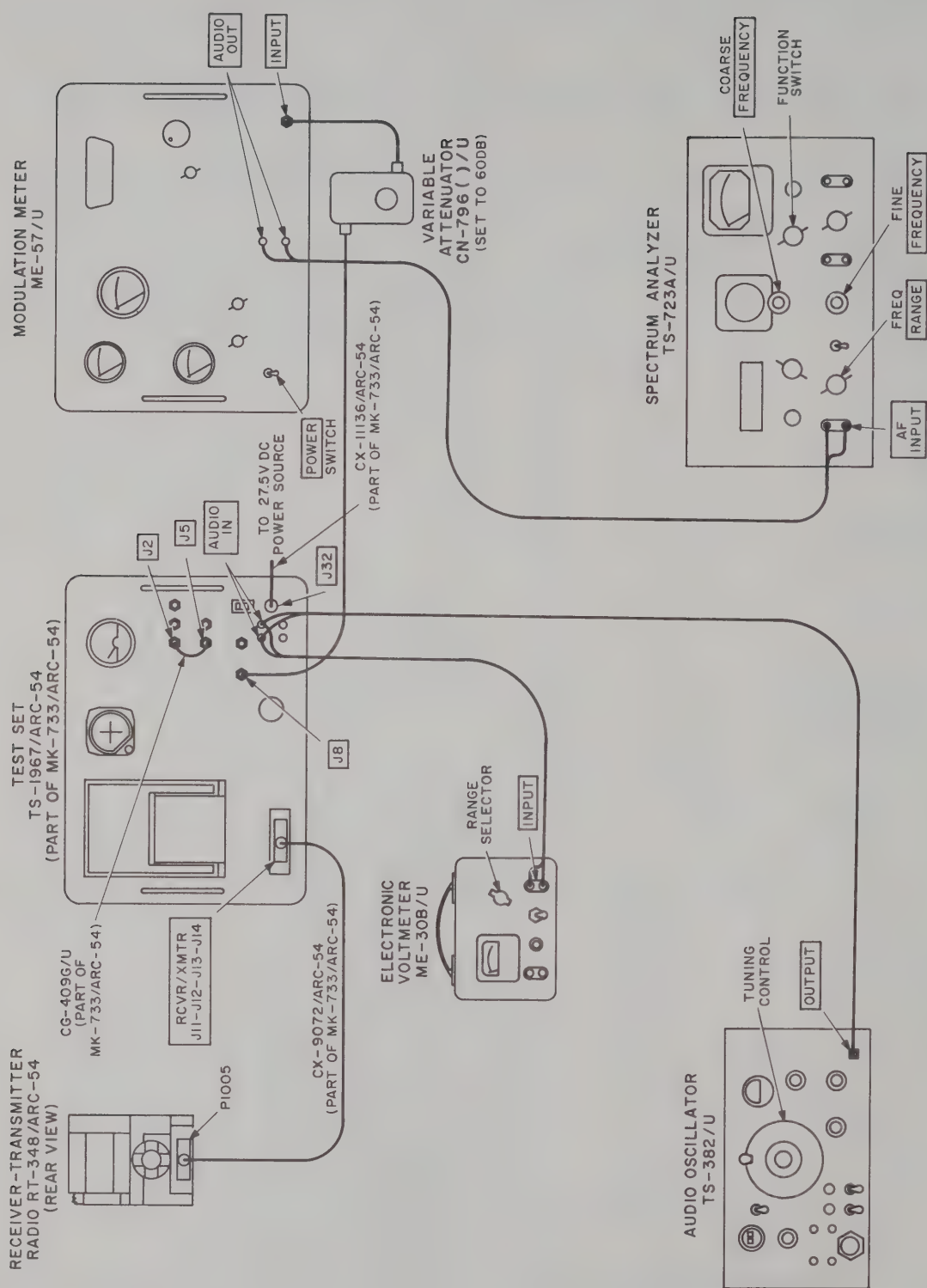
5-7. Transmitter Power Output, 500-Kc Oscillator and Frequency Test

a. Test Equipment and Material. Maintenance Kit, Electronic Equipment MK-733/ARC-54 and Frequency Meter AN/USM-26.

b. Test Connections and Conditions. Connection equipment as shown in figure 5-2. Turn the POWER circuit breaker on the TS-1967/ARC-54 to ON and allow 5 minutes for warmup.

c. Procedure.

Step No.	Control settings		Test procedure	Performance standard																																												
	Test equipment	Equipment under test																																														
1	<i>TS-1967/ARC-54</i> S2: FWD. S3: 30. S4: 0. S5: 0.00. S6: RCV. S8: OFF. S9: TEST S10: RADIO. S11: TEST SET. POWER circuit breaker: ON. All other switches: Any position. <i>AN/USM-26</i> Connected through a 330-ohm resistor to J1402 on transmit audio module.	None.	Set switch S6 to PTT. Observe reading on AN/USM-26.	AN/USM-26 should indicate ± 500 kc ± 500 cps.																																												
2	<i>TS-1967/ARC-54</i> Controls set as in step No. 1. <i>AN/USM-26</i> Connect to J8 on TS-1967/ARC-54.	None.	Starting with 30.00 megacycles, use switches S3, S4, and S5 on the TS-1967/ARC-54 to select each of the following frequencies. Depress S6 on the TS-1967/ARC-54 to PTT at each frequency setting and observe the power output as displayed on the RF POWER meter on the TS-1967/ARC-54. <table><tr><td>30.00</td><td>40.25</td><td>49.25</td><td>60.75</td></tr><tr><td>32.05</td><td>40.30</td><td>50.55</td><td>60.80</td></tr><tr><td>32.10</td><td>41.40</td><td>52.55</td><td>62.50</td></tr><tr><td>33.05</td><td>42.30</td><td>52.60</td><td>63.85</td></tr><tr><td>34.10</td><td>44.35</td><td>54.60</td><td>64.85</td></tr><tr><td>36.15</td><td>44.45</td><td>55.65</td><td>64.90</td></tr><tr><td>37.20</td><td>46.40</td><td>56.65</td><td>66.90</td></tr><tr><td>38.20</td><td>47.40</td><td>56.70</td><td>67.05</td></tr><tr><td>38.25</td><td>48.45</td><td>58.70</td><td>67.95</td></tr><tr><td></td><td>48.50</td><td>59.75</td><td>68.95</td></tr><tr><td></td><td></td><td></td><td>69.95</td></tr></table>	30.00	40.25	49.25	60.75	32.05	40.30	50.55	60.80	32.10	41.40	52.55	62.50	33.05	42.30	52.60	63.85	34.10	44.35	54.60	64.85	36.15	44.45	55.65	64.90	37.20	46.40	56.65	66.90	38.20	47.40	56.70	67.05	38.25	48.45	58.70	67.95		48.50	59.75	68.95				69.95	Power output should not be less than 10 watts for any selected frequency. The listed frequencies must be within ± 5 kc of frequency selected.
30.00	40.25	49.25	60.75																																													
32.05	40.30	50.55	60.80																																													
32.10	41.40	52.55	62.50																																													
33.05	42.30	52.60	63.85																																													
34.10	44.35	54.60	64.85																																													
36.15	44.45	55.65	64.90																																													
37.20	46.40	56.65	66.90																																													
38.20	47.40	56.70	67.05																																													
38.25	48.45	58.70	67.95																																													
	48.50	59.75	68.95																																													
			69.95																																													



NOTE: INDICATES EQUIPMENT MARKING
TM5821-244-35-C4-49

Figure 5-3. Transmitter distortion test setup.

5-8. Transmitter Distortion Test

a. Test Equipment and Materials.

Maintenance Kit, Electronic Equipment MK-733/ARC-54.

Electronic Voltmeter ME-30B/U.

Audio Oscillator TS-382/U.

Modulation Meter ME-57/U.

Variable Attenuator CN-796/U.

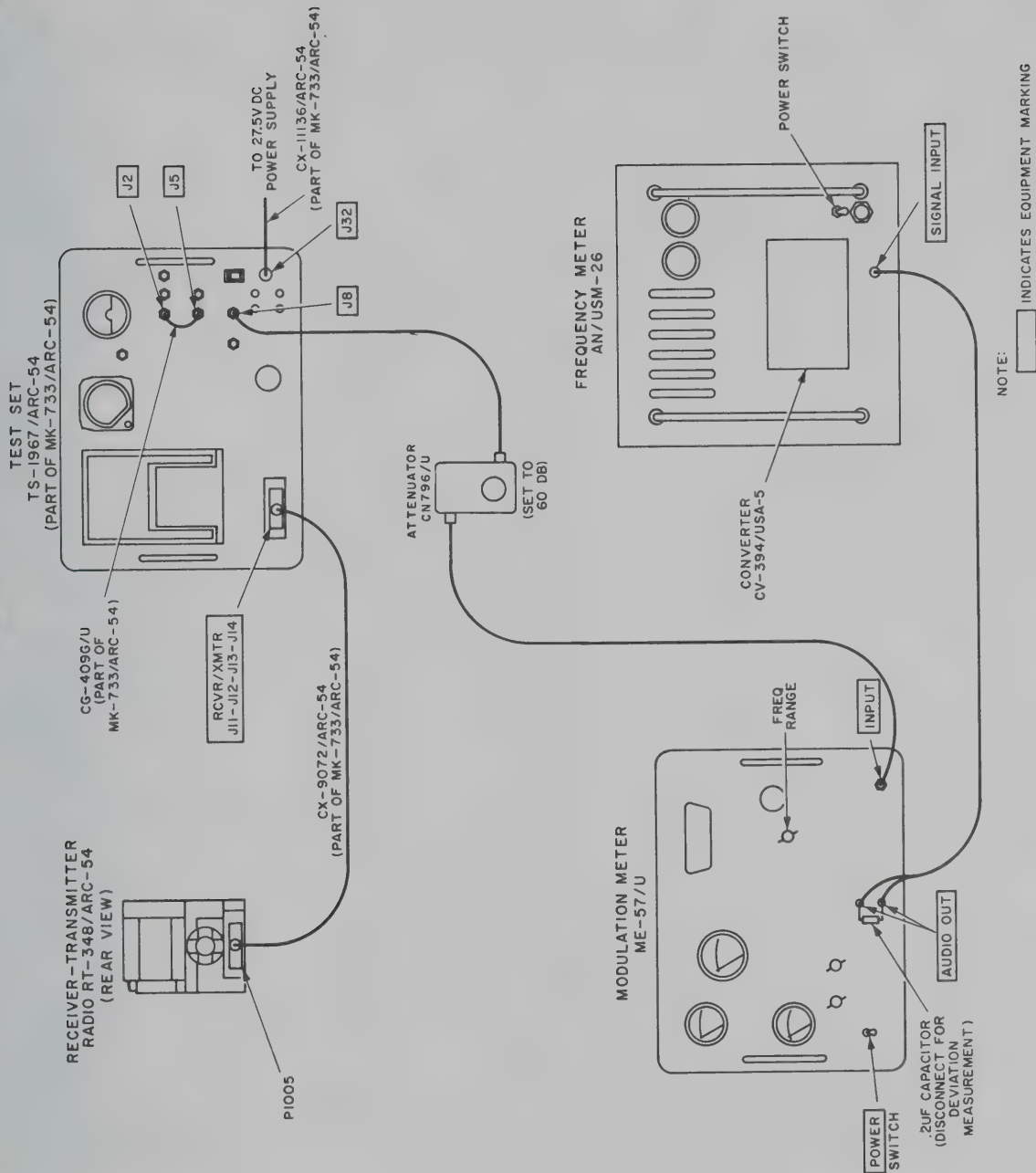
Spectrum Analyzer TS-723A/U.

b. Test Connections and Conditions. Connect the equipment as shown in figure 5-3. Turn the equipment on and allow 3 minutes for warmup.

c. Procedure.

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	<i>TS-1967/ARC-54</i> S2: FWD. S3: 30. S4: 2. S5: 0.05. S6: RCV. S8: OFF. S9: TEST. S10: RADIO. S11: TEST SET. POWER circuit breaker: ON. All other switches: Any position. <i>ME-30B/U</i> Range selector: 1 volt RMS. <i>TS-382/U</i> Main tuning dial: 100. ATTENUATOR: 10. RANGE switch: X10. Output level control: Set for 0.37 volts ac as measured on the ME-30B/U. <i>ME-57/U</i> DEVIATION RANGE: 1000 (TUNE). Band selector: 20-55. TUNE-FINE TUNE: TUNE.	Transmit audio module AUDIO adjustment. Set as instructed in Test procedure column.	a. Set S6 to XMIT. b. Tune the ME-57/U TUNING dial for zero indication on the CARRIER SHIFT meter. Set the ME-57/U TUNEFINE TUNE switch to FINE TUNE and again tune for zero indication on the CARRIER SHIFT meter. To assure that the ME-57/U is tuned properly, slightly detune the TUNING dial both directions from the center setting. The CARRIER SHIFT meter should swing in both directions as the TUNING dial is rotated in both directions. Retune to zero. Set the variable attenuator so that the LIMITING meter on the ME-57/U reads in the black area. c. Set the DEVIATION RANGE switch on the ME-57/U to 20 and adjust the AUDIO adjustment on the RT-348/ARC-54 transmit audio module for a reading on the ME-57/U DEVIATION meter of 10KC. d. Measure the distortion on the TS-723A/U. e. Repeat a through d above at audiofrequencies of 300 and 6000 cps.	a. None. b. None. c. None. d. The meter on the TS-723A/U should indicate 8% or less. e. Same as d above.

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
	TUNING: 32.05 megacycles. <i>TS-723A/U</i> Function switch: DISTORTION. Coarse FREQUENCY: Tune for a sharp dip on meter. Fine FREQUENCY: Tune for maximum dip on meter. BALANCE: Adjust for minimum meter indication. Meter range switch: Set to 10% scale.		<i>f.</i> Repeat <i>a</i> through <i>e</i> above at carrier frequencies of 48.45 mc and 69.95 mc. (Set S3, S4, and S5 on the test set and retune the ME-57/U for each carrier frequency.) <i>g.</i> Return S6 to RCV.	<i>f.</i> Same as <i>d</i> above. <i>g.</i> None.



TM 11-5821-244-35-C4-50

Figure 5-4. Transmitter tone deviation test setup.

5-9. Transmitter Tone Deviation*a. Test Equipment and Materials.*

Maintenance Kit, Electronic Equipment MK-733/ARC-54.

Modulation Meter ME-57/U.

Frequency Meter AN/USM-26.

Capacitor, 0.2 μ f.

Attenuator, 60 db.

b. Test Connections and Conditions. Connect the equipment as shown in figure 5-4. Turn the equipment on.*c. Procedure.*

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	<i>TS-1967/ARC-54</i> S2: FWD. S3: 50. S4: 0. S5: 0.50. S6: RCV. S7: DIS. S8: TONE. S9: TEST. S10: RADIO. S11: TEST SET. All other switches: Any position. POWER circuit breaker: ON. <i>ME-57/U</i> DEVIATION RANGE: 1000 (TUNE). BAND SELECTOR: 20-55. TUNE-FINE TUNE: TUNE. TUNING: 50.50 mega- cycles. <i>AN/USM-26</i> FUNCTION SELECTOR: FREQUENCY. FREQUENCY UNIT: 10. DISPLAY TIME: Set for desired display time.	None.	<u>a.</u> Set S6 to XMIT.... <u>b.</u> Tune ME-57/U TUNING dial for zero indication on CARRIER SHIFT meter. Set ME-57/U TUNE-FINE TUNE control to FINE TUNE and repeat above procedure. Check to see that ME-57/U is tuned correctly by moving TUNING dial slightly off frequency in each direction. CARRIER SHIFT meter should swing away from zero in different direction for clockwise detuning than for counter-clockwise detuning. If meter indicates in same direction in both cases, set the variable attenuator so that LIMITING meter indicates in black area. <u>c.</u> Set DEVIATION RANGE switch on ME-57/U to 20 and observe reading on DEVIATION meter. <u>d.</u> Connect 0.2 μf capacitor across ME-57/U AUDIO OUTPUT terminals and check tone frequency as indicated on AN/USM-26. <u>e.</u> Repeat <u>a</u> through <u>d</u> above with S7 set to CARR and TONE. <u>f.</u> Set S6 to RCV	<u>a.</u> None. <u>b.</u> None. <u>c.</u> Reading should be 3,000 cps $\pm$ 500. <u>d.</u> Frequency should be 150 CPS $\pm$ 3. <u>e.</u> Same as <u>a</u> through <u>d</u> above. <u>f.</u> None.

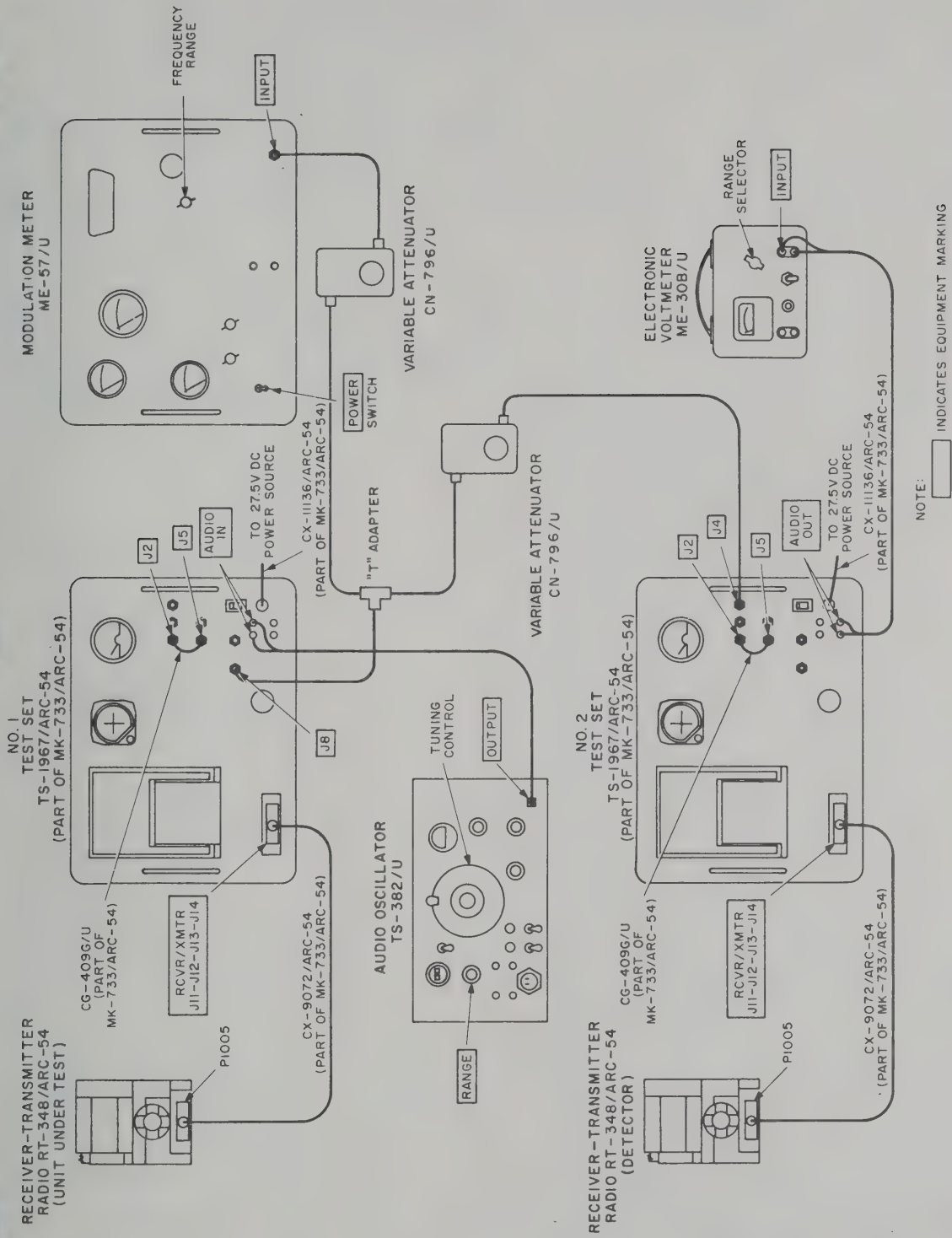


Figure 5-5. Transmitter carrier noise test setup.

TM5821-244-35 - C4-51

5-10. Transmitter Carrier Noise

a. Test Equipment and Materials.

Maintenance Kits, Electronic Equipment MK-733/ARC-54 (two ea).

Receiver-Transmitter, Radio RT-348/ARC-54.

Modulation Meter ME-57/U.

Voltmeter, Electronic ME-30B/U.

Variable Attenuators (two ea) CN-796/U.

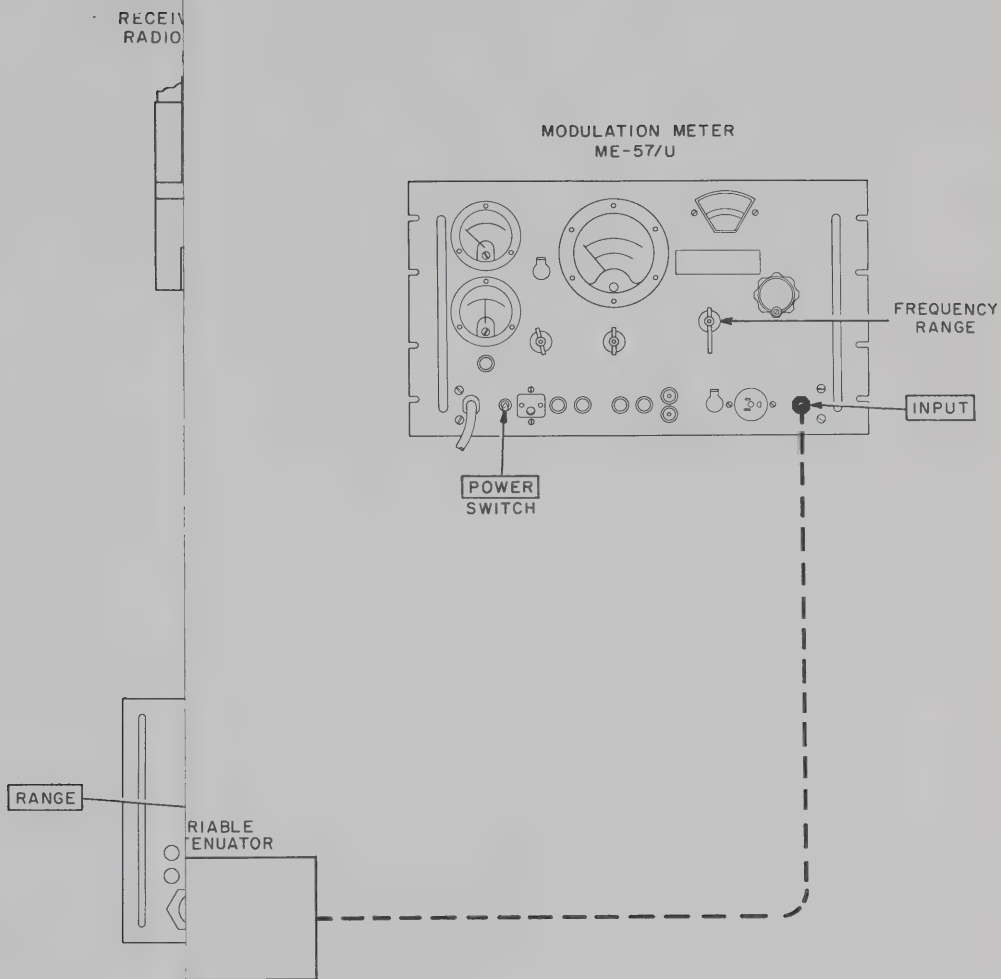
Audio Oscillator TS-382/U.

b. *Test Connections and Conditions.* Connect the equipment as shown in figure 5-5. Turn the equipment on.

c. Procedure.

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	<i>Note.</i> Set switches on both TS-1967/ARG-54's as indicated below: <i>TS-1967/ARC-54</i> S3: 50. S4: 0. S5: 0.50. S6: RCV. S8: OFF. S9: TEST. S10: RADIO. S11: TEST SET: POWER circuit breaker: ON. <i>ME-57/U</i> DEVIATION RANGE: 1000 (TUNE). BAND SELECTOR: 20-55. TUNE-FINE TUNE: TUNE. TUNING: 31 megacycles. <i>TS-382/U</i> Main tuning dial: 100. RANGE switch: X10. ATTENUATOR: 10. Out level control: Set as directed in <i>Test procedure</i> column. <i>ME-30B/U</i> Range selector: 3 volts rms. Attenuator: If variable	None.	a. Set S6 on TS-1967/ARC-54 No. 1 to XMIT. b. Tune ME-57/U TUNING dial for zero indication on CARRIER SHIFT meter. Set ME-57/U TUNE-FINETUNE control to five tune and repeat above procedure. Check to see that ME-57/U is tuned correctly by moving TUNING dial slightly off frequency in each direction. CARRIER SHIFT meter should swing away from zero in different direction for clockwise detuning than for counterclockwise detuning. If meter swings in same direction in both cases, retune to different null. After tuning, adjust the variable attenuator so that LIMITING meter indicates in black area. c. Adjust TS-382/U output level for reading on ME-57/U DEVIATION meter of 10KC. d. Reduce attenuator No. 2 setting to 20 db. e. Adjust GAIN adjust on RT-348/ARC-54 receive audio module for indication of 2.73 volts rms as measured on ME-30B/U. f. Turn off TS-382/U (do not disconnect) and measure ac voltage on ME-30B/U. (Set ME-30B/U range selector to 0.01-volt range.)	a. None. b. None. c. None. d. None. e. None. f. Voltage should be at least 40 db below 2.73-volt reference.

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
	attenuator is used, adjust it to 40 db.		<i>g.</i> Repeat <i>a</i> through <i>f</i> above, with S3, S4, and S5 (on both TS-1967/U's) set for frequency of 50.50 and 68.95 megacycles. (Retune ME-57/U for each fre- quency setting.)	<i>g.</i> Same as above.



MARKING.
E CONNECTIONS
5/2 TEST.

TM5821-244-35-C4-6

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
	attenuator is used, adjust it to 40 db.		<i>g.</i> Repeat <i>a</i> through <i>f</i> above, with S3, S4, and S5 (on both TS-1967/U's) set for frequency of 50.50 and 68.95 megacycles. (Retune ME-57/U for each fre- quency setting.)	<i>g.</i> Same as above.

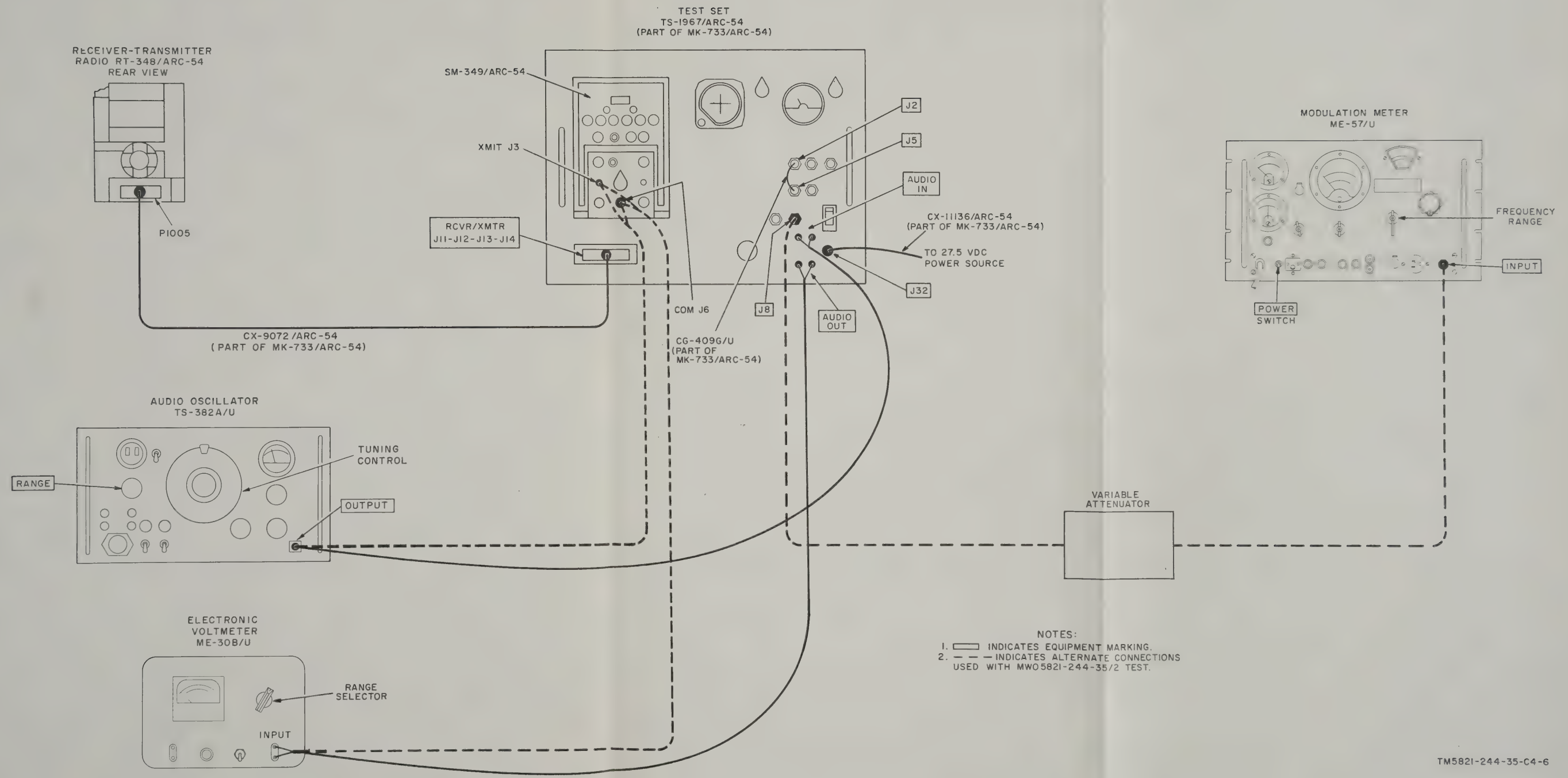


Figure 5-5.1 Sidetone level and MWO 11-5821-244-35/2 test setup.

TM5821-244-35-C4-6

5-10.1 Sidetone Level and MWO 11-5821-244-35/2 Test

a. Test Equipment and Materials.

Maintenance Kit, Electronic Equipment MK-733/ARC-54.

Receiver-Transmitter, Radio RT-348/ARC-54.

Voltmeter, Electronic ME-30B/U.

Modulation Meter ME-57/U.

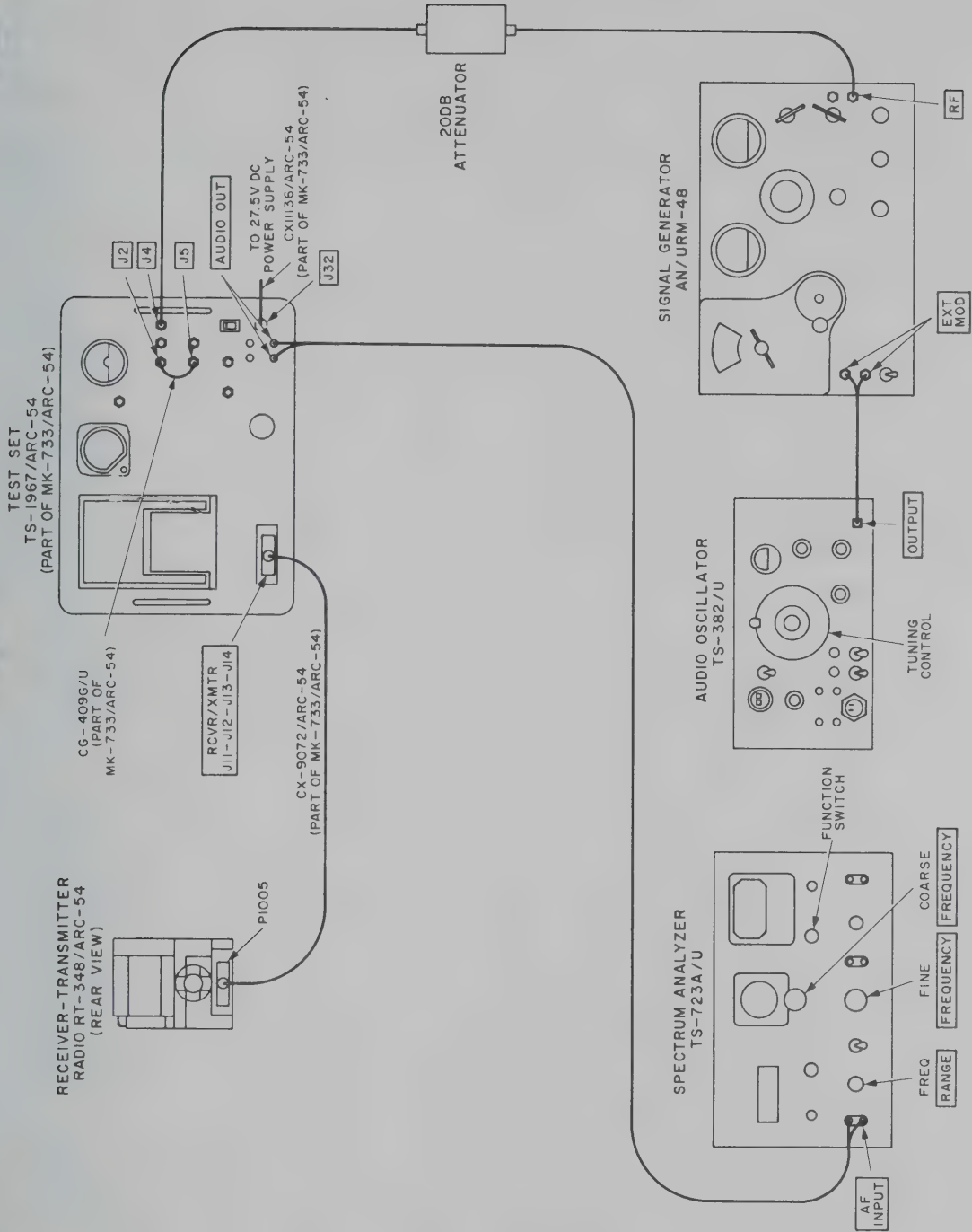
Audio Oscillator TS-382A/U.

b. *Test Connections and Conditions.* Connect the equipment as shown in figure 5-5.1. Turn on the equipment.

c. Procedure.

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	<i>TS-1967/ARC-54</i> S3: 30. S4: 1. S5: 0.00. S6: RCV. S8: OFF. S9: TEST. S10: RADIO. S11: TEST SET. POWER: ON. <i>TS-382A/U</i> Main tuning dial: 100. RANGE switch: X10. ATTENUATOR: X1. OUTPUT level control: For 0.37-volt output. <i>ME-30B/U</i> Range selector: As indicated by <i>Test procedure</i> column.	None.	a. Set ME-30B/U RANGE switch to 1 volt rms. Connect ME-30B/U test leads to AUDIO IN on TS-1967/ARC-54 and adjust TS-382A/U for 0.37-volt ac. b. Set ME-30B/U RANGE switch to 3 volts rms. Disconnect test leads from AUDIO IN on TS-1967/ARC-54 and reconnect test leads to AUDIO OUT. c. Set S6 on TS-1967/ARC-54 to XMIT. d. Observe sidetone output on ME-30B/U. e. Set S6 to RCV.	a. None. b. None. c. None. d. Between 1.2 and 1.4 volt rms. (If necessary, adjust <i>sidetone</i> pot. R1413.) Sidetone output requirement for 3,000 and 1,000 cps only. e. None.
2	<i>TS-1967/ARC-54</i> S3: 50. S4: 0. S5: 0.50. S6: RCV. S8: TONE. S9: TEST. S10: RADIO. S11: TEST SET. POWER circuit breaker: ON. <i>ME-57/U</i> Deviation range: 1000 (TUNE).	None.	a. Set S6 on TS-1967/ARC-54 to XMIT. b. Tune ME-57/U tuning dial for zero indicating on carrier shift meter set the ME-57/U TUNE-FINE TUNE switch to FINE TUNE and again tune for zero indication on the CARRIER SHIFT meter. To assure that the ME-57/U is tuned properly, slightly detune the tuning dial both directions from the center setting, the carrier shift meter should swing in both directions as the tuning dial is rotated	a. None. b. 3 kc $\pm$ 0.5 deviation on the ME-57/U.

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
	Band selector: 20-55. TUNE-FINE TUNE: TUNE. Tuning: 50.50 MC. <i>TS-382A/U</i> Tuning control: 100. RANGE switch: X10. ATTENUATOR: 10. Output level control: Set as directed in <i>Test procedure</i> column. <i>ME-30B/U</i> Range selector: 10 volts.		in both directions retune to zero. After tuning, set the variable attenuator so that the limiting meter on the ME-57/U reads in black area, and set the deviation range switch to 20. c. Turn S8 on TS-1967/ARC-54 to OFF. d. Connect ME-30B/U and TS-382A/U to XMIT J3 and COM J6 on SM-349/ARC-54. Adjust TS-382A/U output level for 8.2 ± 0.4 volts.	c. ME-57/U indicated 0 ± 0.5 kc. d. The voltage on the ME-30B/U should be 8.2 ± 0.4 volts. Deviation should be 9.5 ± 2.5 kc on the ME-57/U. Caution Do not readjust R1437 (TONE DEV).



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TM5821-244-35-52

Figure 5-6. Audio output and distortion test setup.

5-11. Audio Output and Distortion Test

a. Test Equipment and Materials.

Maintenance Kit, Electronic Equipment MK-733/ARC-54.

Attenuator, 20 db.

Signal Generator AN/URM-48.

Audio Oscillator TS-382/U.

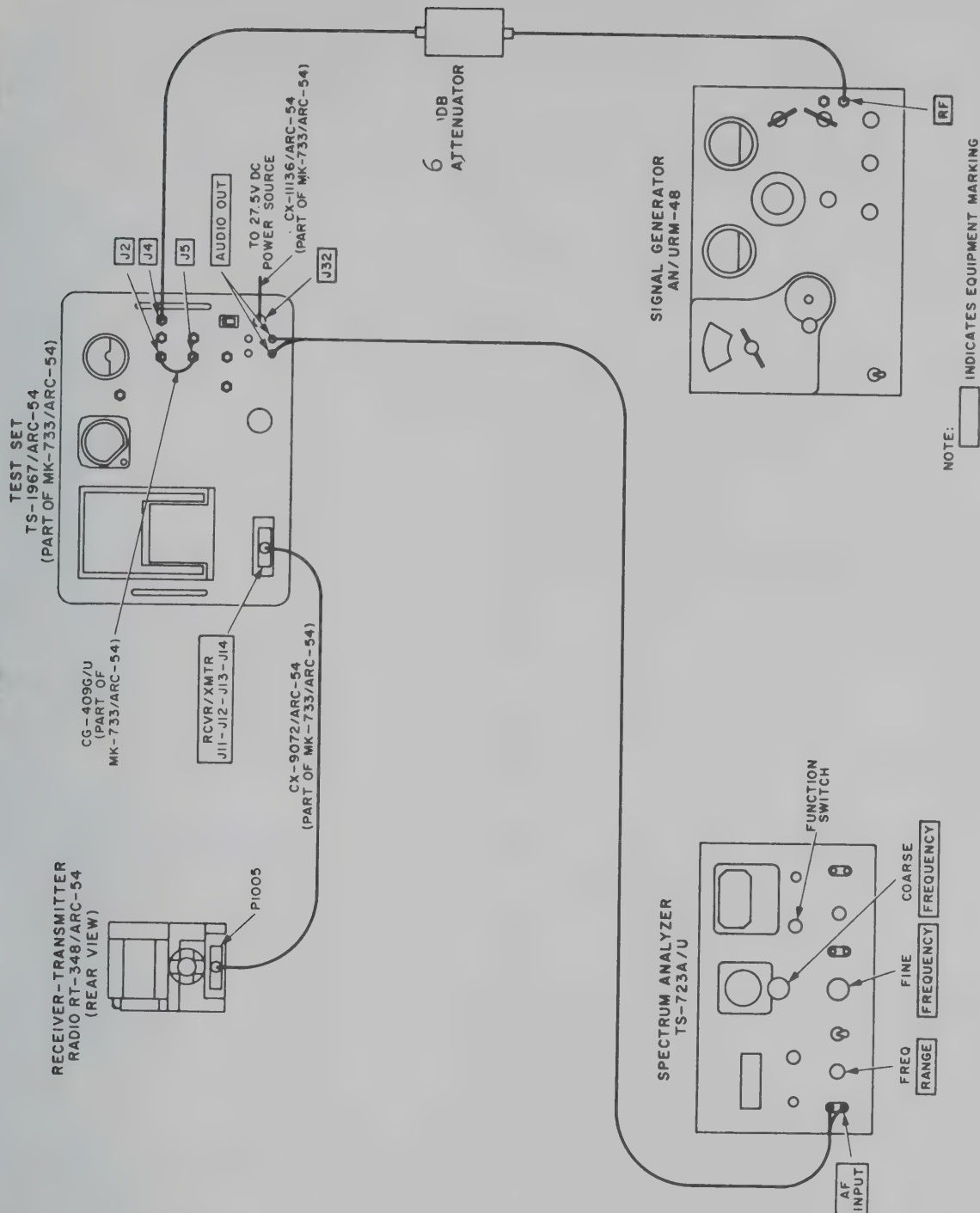
Spectrum Analyzer TS-723A/U.

b. *Test Connections and Conditions.* Remove the dust cover from the RT-348/ARC-54 and connect the equipment as shown in figure 5-6; then turn the equipment on and allow 5 minutes for warmup.

c. Procedure.

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	<i>TS-1967/ARC-54</i> S3: 30. S4: 1. S5: 0.00. S6: RCV. S7: DIS. S8: OFF. S9: TEST. S10: RADIO. S11: TEST SET. All other switches: Any position. POWER circuit breaker ON. <i>AN/URM-48</i> BANDSWITCH: B. RF TUNING: 21 mc. DEVIATION RANGE: 25. OPERATION switch: MOD OFF. RF SET TO LINE: Set for redline indication on meter. RF ATTENUATOR: 0 microvolts. DEVIATION LEVEL: Max ccw. <i>TS-382/U</i> Main tuning dial: 100. ATTENUATOR: 10. Output level control: Max ccw. RANGE switch: X10. <i>TS-723A/U</i> FUNCTION switch:	None.	a. Adjust TS-382/U output level control clockwise until AN/URM-48 DEVIATION meter indicates 10 kilocycles. b. Note no-signal noise level on TS-723A/U (using METER function). Set AN/URM-48 RF ATTENUATOR to 120 and adjust RF TUNING dial to center frequency by tuning for null on TS-723A/U. Reduce AN/URM-48 output until noise level on TS-723A/U is 5 db less than level noted above. Repeat procedure, tuning for null each time signal is reduced until no further null can be obtained. c. Set AN/URM-48 OPERATION switch to EXT MOD and adjust TS-382/U output level to deviate carrier 10 kc as indicated on AN/URM-48 DEVIATION meter. d. Set AN/URM-48 RF MICROVOLTS dial to 120. e. Set TS-723A/U function switch to METER, and meter range switch to 3 volts rms, and adjust R1315 (GAIN adjust) on RT-348/ARC-54 receive audio module for reading on TS-723A/U meter of 2.73 volts rms. f. Tune TS-723A/U to audio-frequency by setting func-	a. None. b. None. c. None. d. None. e. 2.73 volts rms audio output. f. None.

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
	METER. Meter range switch: 0.3 RMS volts. Coarse FREQUENCY: 100. RANGE switch: X10. INPUT control: MIN. AF-RF selector: AF.		tion switch to DISTORTION and tuning TS-723/U for minimum meter reading. g. Measure distortion. h. Measure audio level. (Use TS-723A/U METER function.)	g. Not more than 8%. h. 1.93 to 3.06 volts.
2	Leave controls as in step 1, except: <i>TS-382/U</i> Main tuning dial: 30. RANGE switch: X10. Output level: Readjust to maintain 10-kc deviation on DEVIATION meter.	None.	Repeat step 1 with TS-382/U adjust for 300-cps output.	Same as step 1.
3	Leave controls as in step 1, except: <i>TS-382/U</i> Main tuning dial: 60. RANGE switch: X100. Output level: Readjust to maintain 10-kc deviation.	None.	Repeat step 1 with TS-382/U adjusted for 6,000-cps output.	Same as step 1, except audio level should be between 0.815 and 1.62 volts.
4	Set controls as in step 1, except: <i>TS-1967/ARC-54</i> S3: 50. S4: 0. S5: 50. <i>AN/URM-48</i> Tune to 50.50 megacycles.	None.	Repeat steps 1, 2, and 3, using center frequency of 50.50 MC.	Same as steps 1, 2, and 3.
5	Set controls as in step 1, except: <i>TS-1967/ARC-54</i> S3: 60. S4: 8. S5: 0.95 <i>AN/URM-48</i> Tune to 68.95 megacycles.	None.	Repeat steps 1, 2, and 3, using center frequency of 68.95 MC.	Same as steps 1, 2, and 3.



TM5821-244-35-53

Figure 5-7. Receiver sensitivity, quieting, and limiting test setup.

5-12. Receiver Sensitivity, Quieting, and Limiting

a. Test Equipment and Materials.

Maintenance Kit, Electronic Equipment MK-733/ARC-54.

Spectrum Analyzer TS-723A/U.

Signal Generator AN/URM-48.

Attenuator, 6 db.

b. *Test Connections and Conditions.* Connect the equipment as shown in figure 5-7. Turn the equipment on.

c. Procedure.

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	<i>TS-1967/ARC-54</i> S3: 30. S4: 1. S5: 0.00. S6: RCV. S7: DIS. S8: OFF. S9: TEST. S10: RADIO. S11: TEST SET. All other switches: Any position. POWER circuit breaker: ON. <i>AN/URM-48</i> BANDSWITCH: B. RF TUNING: 31 mc. DEVIATION RANGE: 25. OPERATION switch: MOD OFF. RF SET TO LINE: Set for redline indication on meter. RF ATTENUATOR: 0 microvolts. DEVIATION LEVEL: Max ccw. <i>TS-723/U</i> Function switch: METER. Coarse FREQUENCY: 100. RANGE switch: X10. AF-RF switch: AF. FINE FREQUENCY tune: Tune as directed in <i>Test procedure</i> column.	None.	a. Note no-signal noise level on TS-723A/U meter. Set AN/URM-48 RF ATTENUATOR MICROVOLTS to 120 and tune AN/URM-48 to exact receiver frequency by tuning for null on meter. When null is obtained, reduce AN/URM-48 output until TS-723A/U indicates 5 db less than no-signal level noted above. Retune for null. Repeat above procedure until maximum null is obtained. b. Set AN/URM-48 OPERATION switch to 1000~. Set AN/URM-48 DEVIATION LEVEL for 10KC deviation as indicated on AN/URM-48 DEVIATION meter. Adjust AN/URM-48 RF ATTENUATOR MICROVOLTS to 1.2. c. Set TS-723A/U function switch to METER, and meter range switch to 3 volts rms, and adjust R1315 (GAIN adjust) on RT-348/ARC-54 receive audio module for reading on TS-723A/U meter of 2.73 volts rms. d. Set AN/URM-48 OPERATION switch to MOD OFF and note decrease in reading on TS-723A/U meter. e. Increase AN/URM-48 RF	a. None. b. None. c. 2.73 volts rms audio output. d. The audio output should decrease at least 10db. e. None.

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
	BALANCE: Adjust for minimum meter indication (after 1-KC modulation has been applied). Meter range switch: Set to 0.3 volt rms scale. INPUT control: MIN.		ATTENUATOR MICROVOLTS setting to 120 microvolts, set OPERATION switch to 1000~, and note reading on TS-723A/U meter. f. Set AN/URM-48 OPERATION switch to MOD OFF and note decrease in reading on TS-723A/U meter. g. Set AN/URM-48 OPERATION switch to 1000~. h. Vary AN/URM-48 RF ATTENUATOR MICROVOLTS from 6 to 10K microvolts, observing TS-723A/U meter.	f. Audio output should decrease 40 db. (To read this change, set meter range to -30 db and add -30 db algebraically to meter db reading). g. None. h. Audio output should not vary more than 2 db.
2	Set controls as in step 1, except: <i>TS-1967/ARC-54</i> S3: 50. S4: 0. S5: 0.50 <i>AN/URM-48</i> RF TUNING: 50.50 megacycles.	None.	Repeat step 1, with equipment tuned to 50.50 megacycles.	Same as step 1.
3	Set controls as in step 1, except: <i>TS-1967/ARC-54</i> S3: 60. S4: 8. S5: 0.95. <i>AN/URM-48</i> BANDSWITCH: D. RF TUNING: 68.95 megacycles.	None.	Repeat step 1 with equipment tuned to 68.95 megacycles.	Same as step 1.

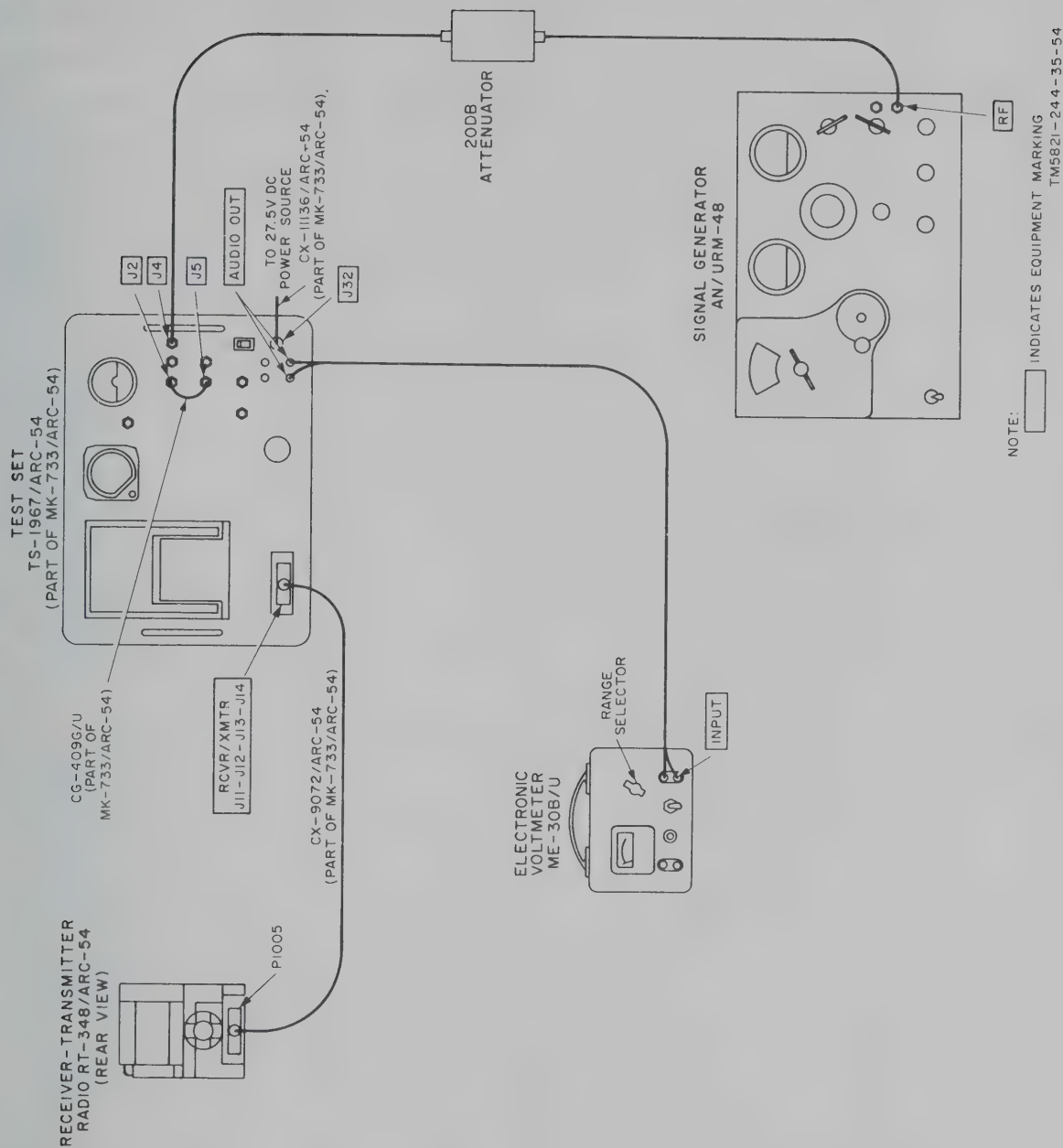


Figure 5-8. Receiver squelch adjustment test setup.

5-13. Receiver Squelch Adjustment

a. Test Equipment and Materials.

Maintenance Kit, Electronic Equipment MK-733/ARC-54.

Electronic Voltmeter, ME-30B/U.

Signal Generator AN/URM-48.

Attenuator, 20 db.

b. Test Connections and Conditions. Connect the equipment as shown in figure 5-8.

c. Procedure.

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	<i>TS-1967/ARC-54</i> S3: 30. S4: 1. S5: 0.00. S6: RCV. S7: DIS. S8: OFF. S9: TEST. S10: Radio. S11: TEST SET. All other switches: Any position. POWER circuit breaker: ON. <i>AN/URM-48</i> BANDSWITCH: B. RF TUNING: 31 MC. DEVIATION RANGE: 25. OPERATION switch: MOD OFF. RF SET TO LINE: Set for redline indication on meter. RF ATTENUATOR MICROVOLTS: 100 microvolts. DEVIATION LEVEL: Max ccw. <i>ME-30B/U</i> Range selector: Set to any range that gives readable indication, and lower range as necessary for nulling.	RT-348 SQ ADJ: Fully clockwise.	<i>a.</i> Tune AN/URM-48 to receiver frequency by tuning for minimum noise (as described in para 5-12c, step 1). (Set ME-30B/U range selector to 3-volt range after tuning.) <i>b.</i> Set S7 on TS-1967/ARC-54 to CARR, and set AN/URM-48 OPERATION switch to 1000~ and DEVIATION LEVEL control for 10KC deviation as measured on AN/URM-48 DEVIATION meter. <i>c.</i> Set AN/URM-48 RF ATTENUATOR MICROVOLTS dial to 0.1 microvolt. Slowly increase RF ATTENUATOR MICROVOLTS dial setting until ME-30B/U indicates receiver unsquelching (sharp increase in meter reading). Note reading on ME-30B/U.	<i>a.</i> None. <i>b.</i> None. <i>c.</i> Receiver should unsquelch at RF ATTENUATOR setting of 6 microvolts or less.

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
2	Leave controls as in step 1.	RT-348 SQ ADJ: Set as instructed in <i>Test procedure</i> column.	a. Set AN/URM-48 RF ATTENUATOR MICROVOLTS dial to 0.6 microvolt and measure the output on the ME-30B/U. b. Set AN/URM-48 RF ATTENUATOR MICROVOLTS to 1.2, OPERATION switch to 1000~, and DEVIATION LEVEL for 10KC deviation as measured on DEVIATION meter. c. Adjust SQ ADJ on receiver-transmitter until receiver just unsquelches (sharp increase in ME-30B/U indication). If the receiver is unsquelched with the SQ ADJ set fully clockwise, leave the SQ ADJ set fully clockwise. Note AN/URM-48 RF ATTENUATOR MICROVOLTS setting. d. Slowly decrease AN/URM-48 RF ATTENUATOR MICROVOLTS setting until receiver just squelches (sharp decrease in meter indication), and note difference in microvolts of input (AN/URM-48 RF ATTENUATOR MICROVOLTS) between receiver unsquelch and receiver squelch. e. Repeat a through d above for carrier frequencies of 50.50 and 68.95 MC.	a. Audio output should decrease at least 45 db from previous level. b. None. c. None. d. Difference in RF input required for squelch and unsquelch should be 0.6 microvolt or less. e. Same as a through d above.

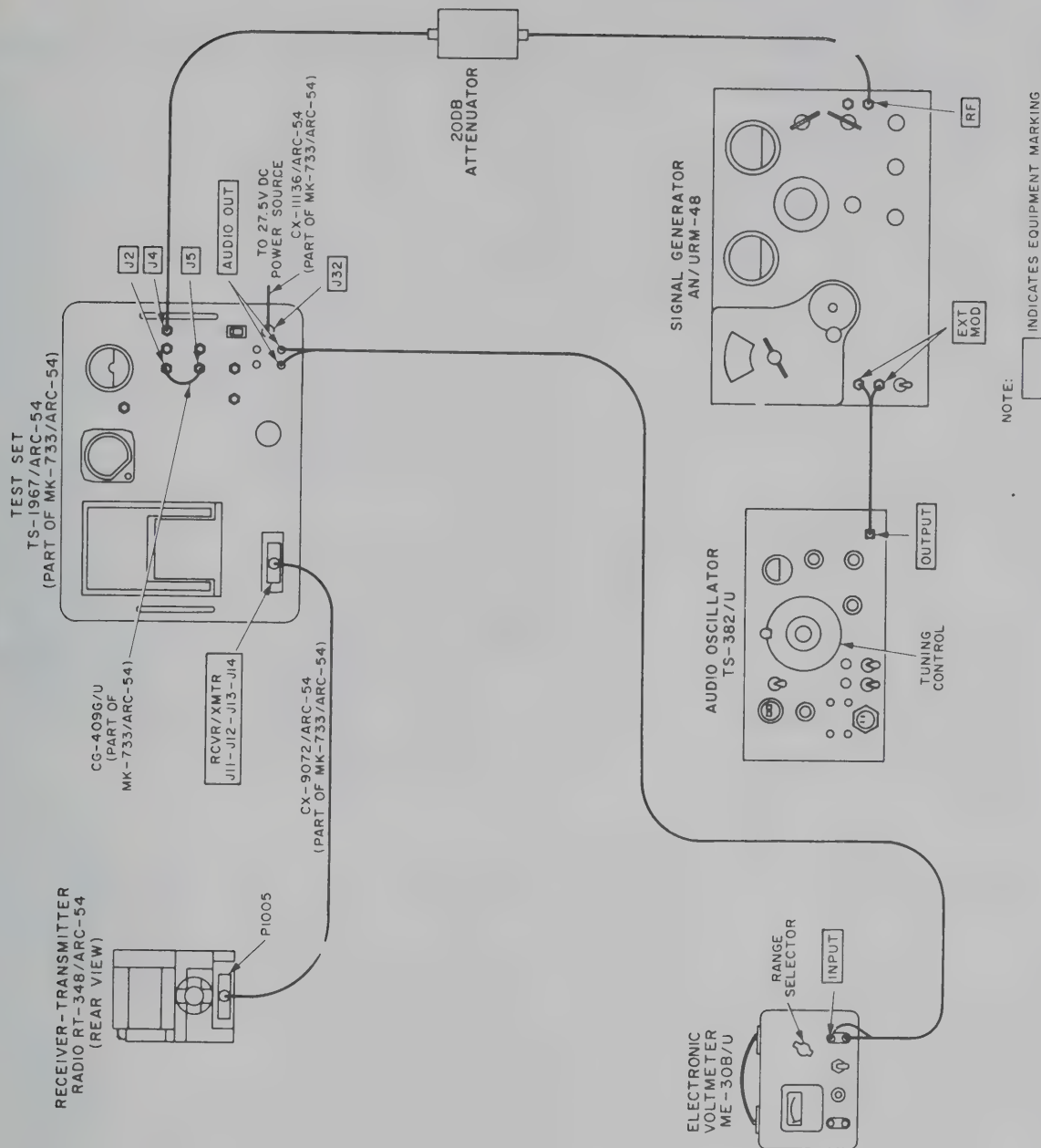


Figure 5-9. Tone squelch test setup.

TM5821-244-35-55

5-14. Tone Squelch

a. *Test Equipment and Materials.*

Maintenance Kit, Electronic Equipment MK-733/ARC54.

Voltmeter, Electronic ME-30B/U.

Signal Generator AN/URM-48.

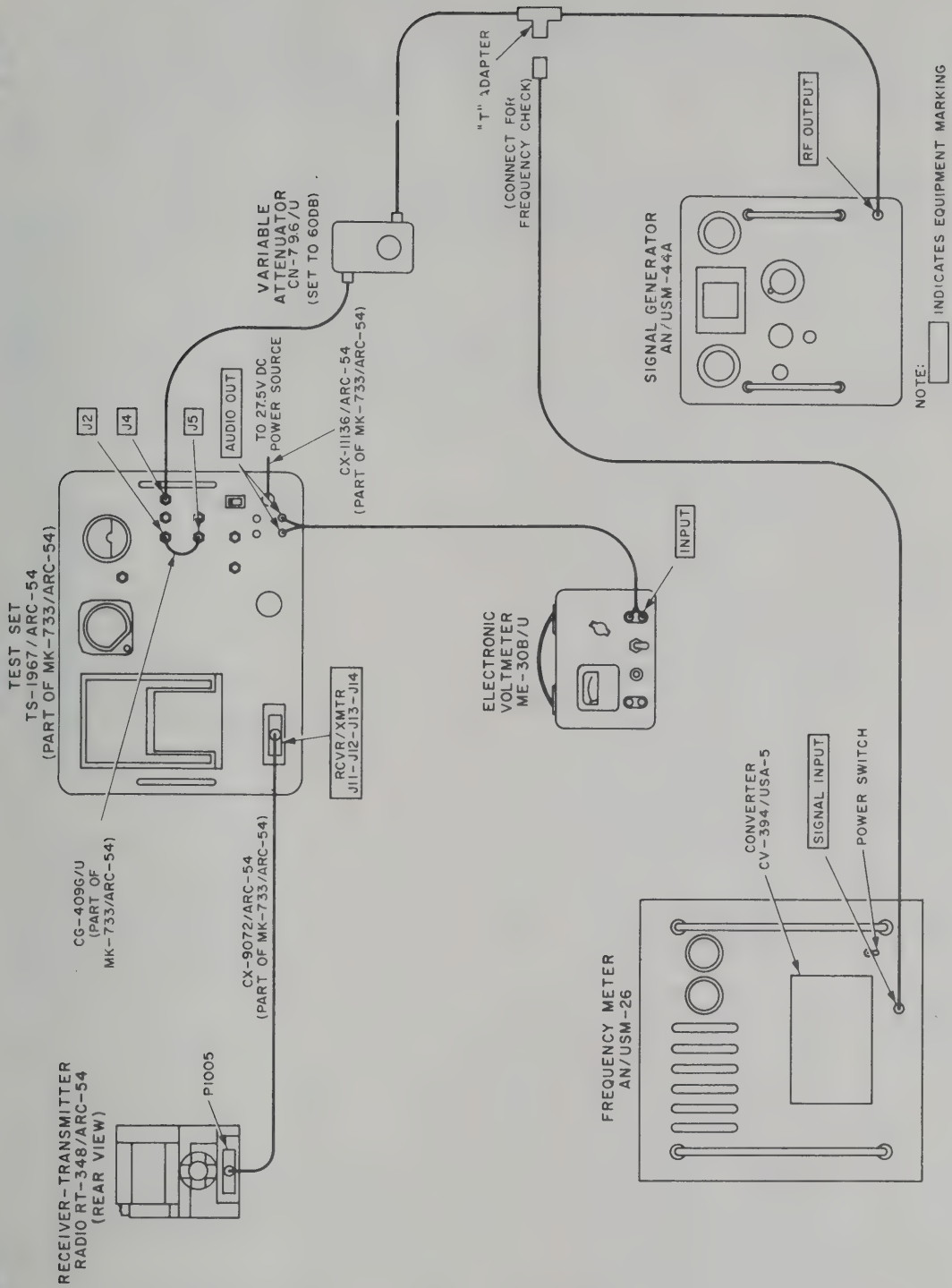
Audio Oscillator TS-382/U.

Attenuator, 20 db.

b. *Test Connections and Conditions.* Connect the equipment as shown in figure 5-9. Strap the RT-348/ARC-54 receive audio module for deemphasis enable.

c. *Procedure.*

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	<i>TS-1967/ARC-54</i> S3: 50. S4: 0. S5: 0.50 S6: RCV. S7: DIS. S8: TONE. S9: TEST. S10: RADIO. S11: TEST SET. POWER circuit breaker: ON. <i>AN/URM-48</i> BANDSWITCH: C. RF TUNING: 50.50 megacycles. DEVIATION RANGE: 25. OPERATION switch: MOD OFF. RF ATTENUATOR: 120 microvolts. RF SET TO LINE: Set for redline indication on meter. DEVIATION LEVEL: Max ccw. <i>TS-382/U</i> Main tuning dial: 150. RANGE switch: X1. ATTENUATOR: 10. Output level control: Set as instructed in <i>Test procedure</i> column. <i>ME-30B/U</i> Meter range switch: 3 volts rms.	None.	a. Tune AN/URM-48 to receiver frequency by tuning for minimum noise (as described in para. 5-12c, step 1). b. Set AN/URM-48 OPERATION switch to EXT MOD, and RF ATTENUATOR MICROVOLTS to minimum. Set S7 on TS-1967/ARC-54 to TONE. c. Set TS-382/U output level control for reading on AN/URM-48 DEVIATION meter of 3 KC. d. Slowly increase setting of AN/URM-48 RF ATTENUATOR MICROVOLTS (maintain redline adjustment of RF SET TO LINE adjust) until ME-30B/U indicates receiver unquenching. e. Set AN/URM-48 RF ATTENUATOR MICROVOLTS to 120, adjust for 2.5 KC deviation, and set TS-382/U main tuning dial to 145 CPS. Set AN/URM-48 OPERATION switch to MOD OFF and note that receiver squelches as indicated by sharp decrease in reading on ME-30B/U. Set AN/URM-48 OPERATION switch to EXT MOD and verify that receiver unsquelches. f. Set the TS-382/U main tuning dial to 155 CPS (maintain 2.5-KC deviation) and note the same results as in e above.	a. None. b. None. c. None. d. Receiver should unsquelch at input of 1.2 microvolts or less. e. Receiver should squelch with modulation off and unsquelch with modulation on. f. Same as e above.



TM5821-244-35-C4-56

Figure 5-10. Receiver center frequency test setup.

5-15. Receiver Center Frequency

a. Test Equipment and Materials.

Maintenance Kit, Electronic Equipment MK-733/ARC-54.
 Frequency Meter AN/USM-26 with Frequency Converter CV-394/USA-5.
 Signal Generator AN/USM-44A.
 Voltmeter, Electronic ME-30B/U.
 Attenuator, 60 db.

b. *Test Connections and Conditions.* Connect the equipment as shown in figure 5-10. Turn on the equipment and allow 10 minutes for warmup.

c. Procedure.

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	<i>TS-1967/ARC-54</i> S3: 30. S4: 1. S5: 0.00. S6: RCV. S7: DIS. S8: OFF. S9: TEST. S10: RADIO. S11: TEST SET. All other switches: Any position. POWER circuit breaker: ON. <i>AN/USM-44A</i> FREQUENCY RANGE: B. FREQ control: Set to 31.00 megacycles. MOD SELECTOR: CW. Attenuator dial: Minimum attenuation. <i>Attenuator</i> Set to 60 db. <i>AN/USM-26</i> FUNCTION SELECTOR: Set to FREQUENCY. FREQUENCY UNIT: 1. <i>CV-394/USA-5</i> (p/o AN/USM-26) RANGE-MC: 20-40. MIXING FREQUENCY	None.	a. With AN/USM-44A FREQ control set to 31.00 megacycles, set OUTPUT LEVEL control on AN/USM-44A to minimum (max ccw). Note reading on ME-30B/U. b. Rotate AN/USM-44A OUTPUT LEVEL control clockwise until reading on ME-30B/U decreases 5 db from level noted in a above. c. Carefully tune AN/USM-44A FINE FREQ ADJUST for null (minimum reading) on ME-30B/U. d. Repeat b and c above until no further reduction in reading can be obtained. e. Connect AN/USM-26 as shown. f. Rotate AN/USM-44A OUTPUT LEVEL control fully clockwise. g. Set AN/USM-26 GAIN control to MAX, and tune tuning dial for maximum closure of tuning eye. If eye closes completely, rotate GAIN control counterclockwise until tuning eye just slightly opens. Retune TUNING dial as necessary for maximum closure of tuning eye, and decrease GAIN control as necessary for slightly open tuning eye. h. Set AN/USM-26 MIXING FREQUENCY MCS switch to 30 and read	a. None. b. None. c. None. d. None. e. None. f. None. g. None. h. Frequency meter should indicate 1 mc ± 5KC. (This is an actual

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
	MCS: TUNE. TUNING: Set as instructed in <i>Test procedure</i> column. GAIN: Set as instructed in <i>Test procedure</i> column. <i>ME-30B/U</i> Range selector: Set to position that gives convenient reading. Change to lower ranges as necessary when nulling.		frequency on counters. i. Repeat <i>a</i> through <i>h</i> above, with TS-1967/ARC-54 and AN/USM-44A tuned to 50.50 megacycles. Set AN/USM-26 MIXING FREQUENCY MCS to 50 and RANGE-MC to 40-100. j. Repeat <i>a</i> through <i>h</i> above, with TS-1967/ARC-54 and AN/USM-44A tuned to 68.95 megacycles. Set AN/USM-26 MIXING FREQUENCY MCS to 60 and RANGE-MCS to 40-100.	indication of 31.000 megacycles ± 0.005, since mixing frequency is 30 megacycles.) i. Frequency meter should indicate 500KC ± 5. (This is an actual indication of 50.500 megacycles ± 0.005, since mixing frequency is 50 megacycles.) j. Frequency meter should indicate 8.950 MC ± 5KC. (This is an actual indication of 68.950 megacycles ± 0.005, since mixing frequency is 60 megacycles.)

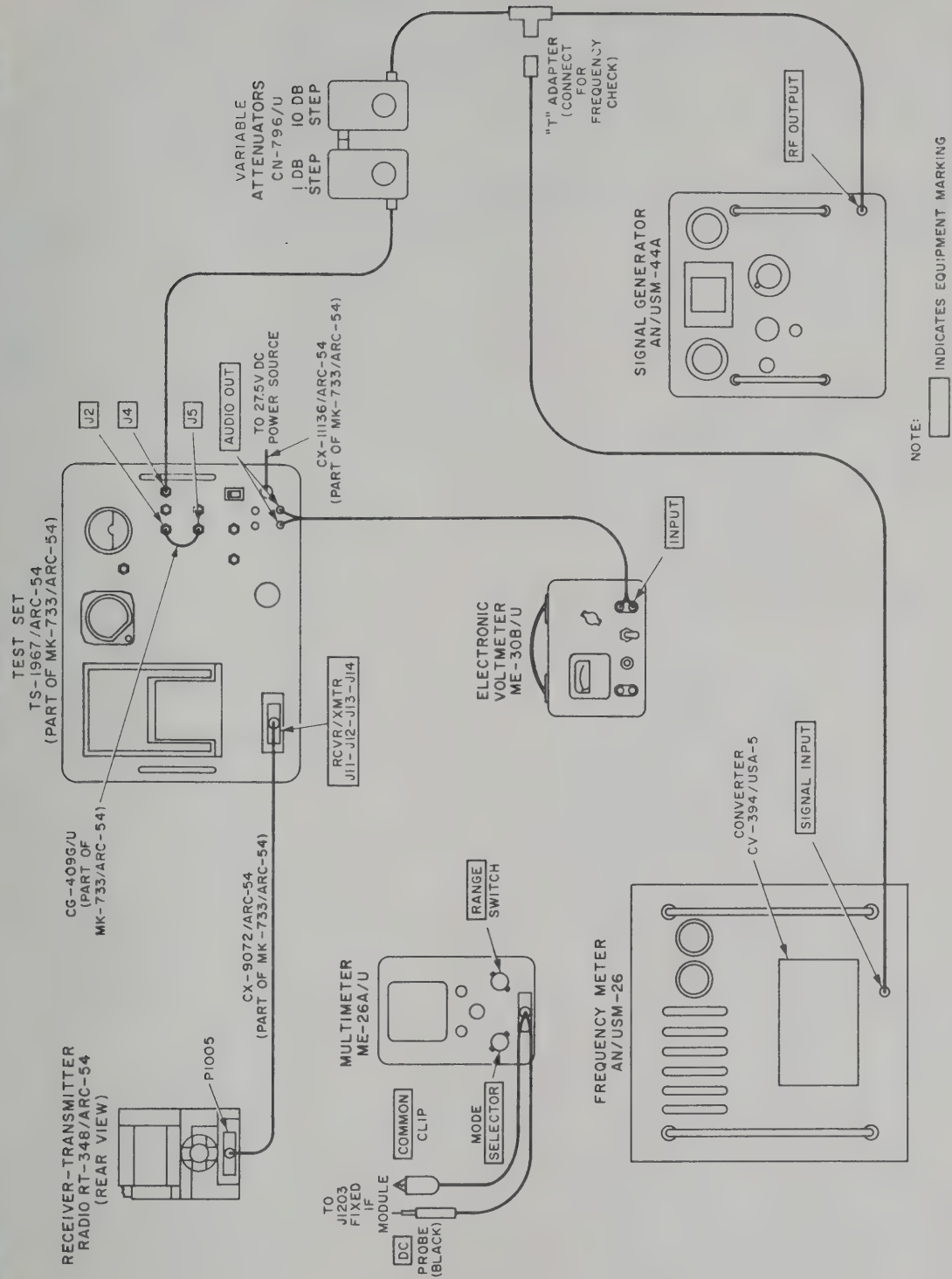


Figure 5-11. Receiver selectivity test setup.

TM 5821-244-35-C4-57

5-16. Receiver Selectivity

a. Test Equipment and Materials.

Maintenance Kit, Electronic Equipment MK-733/ARC-54.

Frequency Meter AN/USM-26 with Frequency Converter CV-394/USA-5.

Variable Attenuators CN-796/U (two).

Voltmeter, Electronic ME-30B/U.

Signal Generator AN/USM-44A.

Multimeter ME-26A/U.

b. *Test Connections and Conditions.* Connect the equipment as shown in figure 5-11. Do not connect the AN/USM-26 or the ME-26A/U until instructed to do so. Maintain a 6-db setting on one attenuator throughout the test.

c. Procedure.

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	<i>TS-1967/ARC-54</i> S3: 30. S4: 1. S5: 0.00. S6: RCV. S7: DIS. S8: OFF. S9: TEST. S10: RADIO. S11: TEST SET. All other switches: Any position. POWER circuit breaker: ON. <i>AN/USM-44</i> FREQUENCY RANGE: B. FREQ control: Set to 31.00 MC. MOD SELECTOR: CW. Attenuator dial: minimum attenuation. OUTPUT LEVEL: MAX. <i>Attenuators</i> Set one to 6 db. Set the other to zero. <i>ME-30B/U</i> Range selector: Set to position that gives convenient reading. Change to lower scales as necessary for nulling.	<i>RT-348/ARC-54</i> TEST SWITCH: 6.	a. With AN/USM-44A control set to 31.00 megacycles. b. Tune AN/USM-44A to exact receiver frequency by tuning for minimum noise (as described in para 5-15c). c. Increase OUTPUT LEVEL control on AN/USM-44A to maximum. d. Observe the operation of TEST METER on RT-348/ARC-54; increase attenuator settings until ME-26A/U meter reading stops increasing. Decrease attenuation slightly and record total attenuation and voltage level indicator on ME-23A/U. (Make measurement with ME-26A/U DC probe at J1203 and common clip connected to RT-348/ARC-54 chassis). e. Decrease HP-355A attenuator 6 db and vary AN/USM-44 FREQ control above and below center frequency, observing two frequencies at which voltage at J1203 is same as reference voltage recorded in d above. f. Decrease HP-355B attenuator to 60 db below attenuation recorded in d above. Again vary AN/USM-44A FREQ control above and below center frequency, noting frequencies at which volt-	a. None. b. None. c. None. d. None. e. Difference between two frequencies should not be less than 30KC. f. Difference between two frequencies should not be more than 55KC.

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
	<i>ME-26A/U</i> Mode SELECTOR: +. RANGE switch: 10 volts. (Use dc probe and common clip.)		age indicated on ME-26A/U agrees with voltage re- corded in <i>d</i> above. <i>g.</i> Decrease HP-355B attenuator to 80 db below attenuation recorded in <i>d</i> above. Again vary AN/USM-44A FREQ control above and below center frequency, noting frequencies at which voltage indicated on ME-26A/U agrees with voltage recorded in <i>d</i> above. <i>h.</i> Repeat <i>a</i> through <i>g</i> above, with TS-1967/ARC-54 and AN/USM-44 tuned to frequencies of 50.50 and 68.95 megacycles.	<i>g.</i> Difference between two frequencies should not be more than 100KC. <i>h.</i> Same as <i>e</i>, <i>f</i>, and <i>g</i> above.

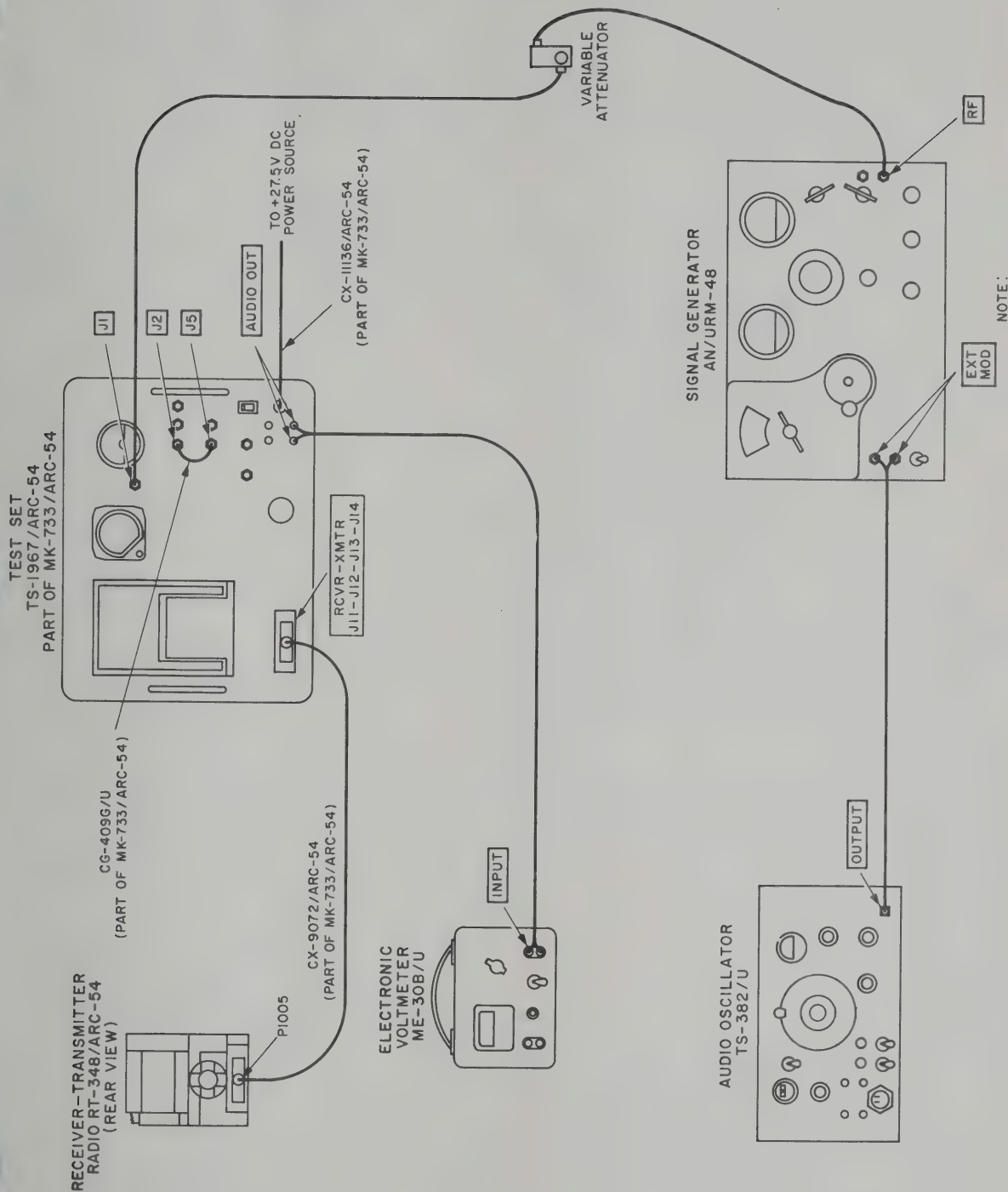


Figure 5-12. Homing test setup.

5-17. Homing Test

a. Test Equipment and Materials.

Maintenance Kit, Electronic Equipment MK-733/ARC-54.

Signal Generator AN/URM-48.

Voltmeter, Electronics ME-30B/U.

Audio Oscillator TS-382/U.

Variable Attenuator CN-796/U.

b. Test Connections and Conditions. Connect the equipment as shown in figure 5-12.

c. Procedure.

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	<i>TS-1967/ARC-54</i> S1: On course. S3: 50. S4: 0. S5: 0.50. S6: RCV. S7: CARR. S8: OFF. S9: HOME. S10: RADIO. S11: TEST SET. POWER circuit breaker: ON. <i>AN/URM-48</i> BANDSWITCH: C. RF tuning: 50.50 mc. OPERATION switch: MOD OFF. RF SET TO LINE: Set for redline indication on meter. RF ATTENUATOR: Set to minimum. <i>TS-382/U</i> Main tuning dial: 150. Range switch: X1. Attenuator: 10. OUTPUT level control: Set as instructed in <i>Test procedure</i> column. <i>ME-30B/U</i> Range selector: Set to position that gives convenient reading. Change to lower ranges as necessary when	None.	a. Tune AN/URM-48 to receiver center frequency by tuning for minimum noise (para 5-12c, step 1). b. Increase RF ATTENUATOR on the AN/URM-48 until flag-down condition is observed. c. Vertical needle of the ID-48/ARN indicator should be centered; if not, adjust R227 on homer module. d. Set RF ATTENUATOR on AN/URM-48 to 10 uv. e. Set S1 to left then to right position. (Adjust R-224 so that the ID-48/ARN vertical needle deflection is between the first and second dots.) f. Vary the RF ATTENUATOR on AN/URM-48 from 10 to 10,000 microvolts. g. Set AN/URM-48 OPERATION switch to EXT MOD and set RF ATTENUATOR to 10μv. Increases TS-382/U output level control until AN/URM-48 kilocycles deviation meter indicates 3 kc deviation.	a. None. b. The AN/URM-48 output should be not more than 4.8 μv. c. None. d. None. e. ID-48/ARN vertical needle should swing to left or right position in accordance with position of S1. <i>Note.</i> Deflection to the right should be within 10° of the deflection to the left. f. ID-48/ARN vertical needle should deflect at least the distance of one wing, for both right and left deflection. As the input is increased, the horizontal needle should move upward with no more than 10 μv input and reach 0 or center position, at 10,000μv. g. None.

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
	nulling. Set attenuators to 14db.		<i>h.</i> Set S7 on TS-1967/ARC-54 to TONE and observe ID-48/ARN flags. <i>i.</i> Repeat <i>d</i> through <i>h</i> above with TS-1967/ARC-54 and AN/URM-48 adjusted to frequencies of 31.00 and 69.95 megacycles.	<i>h.</i> Flags should activate. <i>i.</i> Same as <i>d</i> through <i>h</i> above.

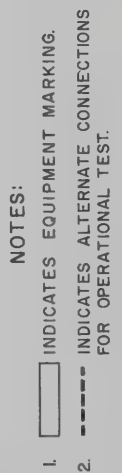


Figure 5-12.1 Channel changing tone test setup and operational test.

5-17.1 Channel Changing Tone, Squelch Distortion, Channel Time Test

a. Test Equipment and Materials.

Maintenance Kit, Electronic Equipment MK-733/ARC-54.

Receiver-Transmitter, Radio RT-348/ARC-54.

Headset-Microphone H-101A/U.

b. Test Conditions and Connections. Connect the equipment as shown in figure 5-12.1.

c. Procedure.

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	<i>TS-1967/ARC-54</i> S3: 30. S4: 1. S5: 0.00. S6: RCV. S7: CARR. S8: OFF. S9: PTT. S10: RADIO. S11: TEST SET. POWER: ON.	None.	Change S3 to 40.	Observe the presence of approximately 800-cps tone in headset which continues during the changing cycle.
2	<i>H-101/U</i> Connect to J9 on TS-1967/ARC-54.	<i>RT-348/ARC-54</i> Test switch: Set as instructed in <i>Test procedure</i> column.	Press SQ DIS switch on the front panel of RT-348/ARC-54.	Note rushing noise in H-101/U.
3	<i>TS-1967/ARC-54</i> S3: 31. S4: 0. S5: 0.00. S6: RCV. S7: DIS. S9: PTT. S10: RADIO. S11: TEST SET. POWER: ON.	None.	Rotate S3 from 31 to 30.	Channeling time should be no more than 6 seconds.

5-17.2 Operational Test

a. Test Equipment and Materials.

Maintenance Kit, Electronic Equipment MK-733/ARC-54.

Mounting MT-1535/ARC-54.

Headset-Microphone H-101/U.

Vibration table—Required 1.00 Gs with frequency of vibration 25 ± 5 cps.

b. Test Connections and Conditions. Connect the equipment as shown in figure 5-12.1.

c. Procedure.

Note

This Test to be performed at Depot category only.

Step No.	Control settings		Test procedure	Performance standard																																																				
	Test equipment	Equipment under test																																																						
1	<i>TS-1967/ARC</i> S3: 30. S4: 6. S5: 0.40. S6: RCV. S7: CARR. S8: OFF. S9: PTT. S10: RADIO. S11: TEST SET. POWER circuit breaker: ON; All other switches: Ant position.	None.	a. Connect a wattmeter to antenna connection J7 and connect H101/U to HEAD-SET connection J9 on TS-1967/ARC-54. <i>Note.</i> An antenna may be substituted on frequencies that may require it for transmission to test station. b. Mount the MT-1535/ARC-54 mounting to the vibration table. <i>Note.</i> The isolators on Mounting MT-1535/ARC-54 must be blocked during this test. c. RT-348/ARC-54 inserted in mounting MT-1535/ARC-54 with vibration table operating, communication shall be established with a unit approximately 100 feet distance from RT-348/ARC-54 under test. Caution: Time for specific test should not exceed more than 2 minutes. d. Repeat c above using frequencies of 40.90 MC and 46.60 MC.	a. None. b. None. c. Reception and transmission should be audible. d. Same as c above.																																																				
2	Leave controls as in step No. 1.	None.	a. Discontinue operation of vibration table. b. With transmitter unkeyed, tune the receiver to the following frequencies and monitor audio output with headset. <table><tr><td>30.0</td><td>40.30</td><td>50.50</td><td>62.80</td></tr><tr><td>32.05</td><td>41.30</td><td>50.55</td><td>63.85</td></tr><tr><td>32.10</td><td>42.30</td><td>52.55</td><td>64.85</td></tr><tr><td>33.05</td><td>44.35</td><td>52.60</td><td>64.90</td></tr><tr><td>33.10</td><td>44.45</td><td>54.60</td><td>66.90</td></tr><tr><td>36.15</td><td>46.40</td><td>55.65</td><td>67.00</td></tr><tr><td>37.20</td><td>47.40</td><td>56.65</td><td>67.05</td></tr><tr><td>38.20</td><td>48.45</td><td>56.70</td><td>68.95</td></tr><tr><td>38.25</td><td>48.50</td><td>58.70</td><td>69.95</td></tr><tr><td>40.25</td><td>49.50</td><td>59.75</td><td></td></tr><tr><td></td><td></td><td>60.75</td><td></td></tr><tr><td></td><td></td><td>60.80</td><td></td></tr><tr><td></td><td></td><td>62.50</td><td></td></tr></table>	30.0	40.30	50.50	62.80	32.05	41.30	50.55	63.85	32.10	42.30	52.55	64.85	33.05	44.35	52.60	64.90	33.10	44.45	54.60	66.90	36.15	46.40	55.65	67.00	37.20	47.40	56.65	67.05	38.20	48.45	56.70	68.95	38.25	48.50	58.70	69.95	40.25	49.50	59.75				60.75				60.80				62.50		a. None. b. No oscillation will be heard in headset.
30.0	40.30	50.50	62.80																																																					
32.05	41.30	50.55	63.85																																																					
32.10	42.30	52.55	64.85																																																					
33.05	44.35	52.60	64.90																																																					
33.10	44.45	54.60	66.90																																																					
36.15	46.40	55.65	67.00																																																					
37.20	47.40	56.65	67.05																																																					
38.20	48.45	56.70	68.95																																																					
38.25	48.50	58.70	69.95																																																					
40.25	49.50	59.75																																																						
		60.75																																																						
		60.80																																																						
		62.50																																																						

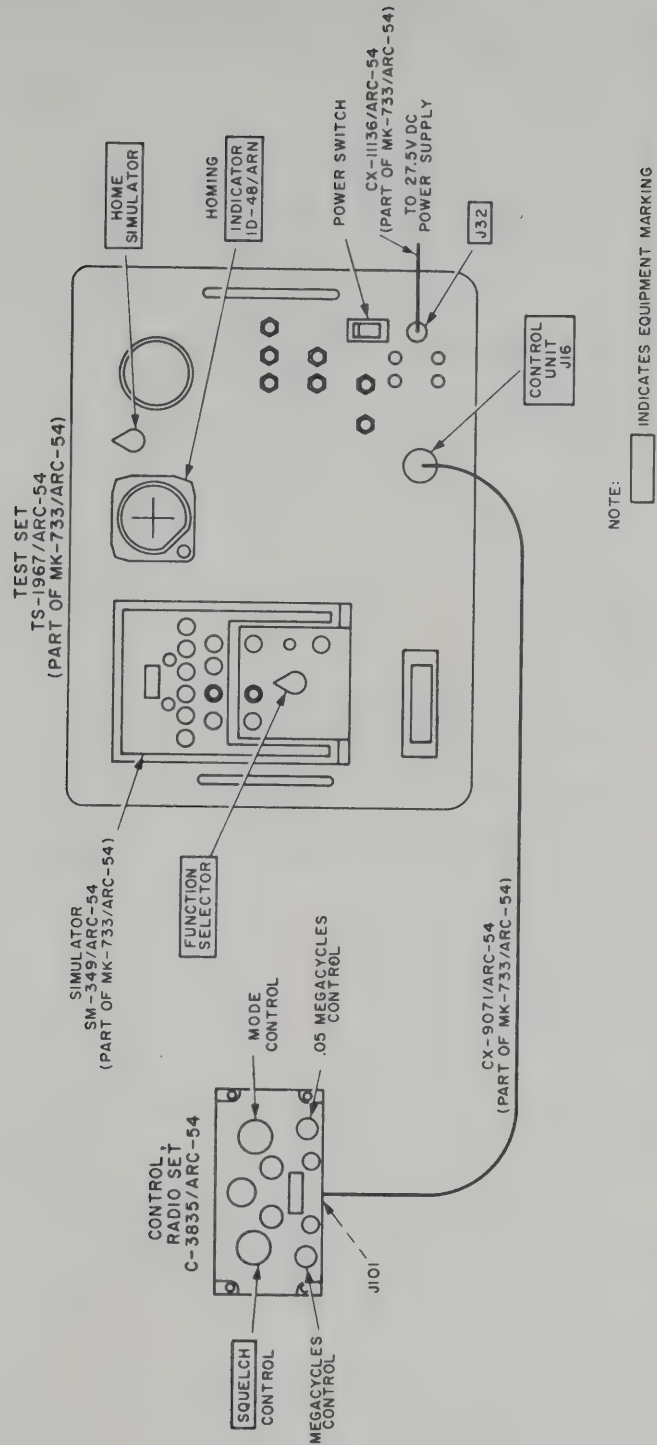


Figure 5-13. Control unit frequency selection and panel lamp test setup.

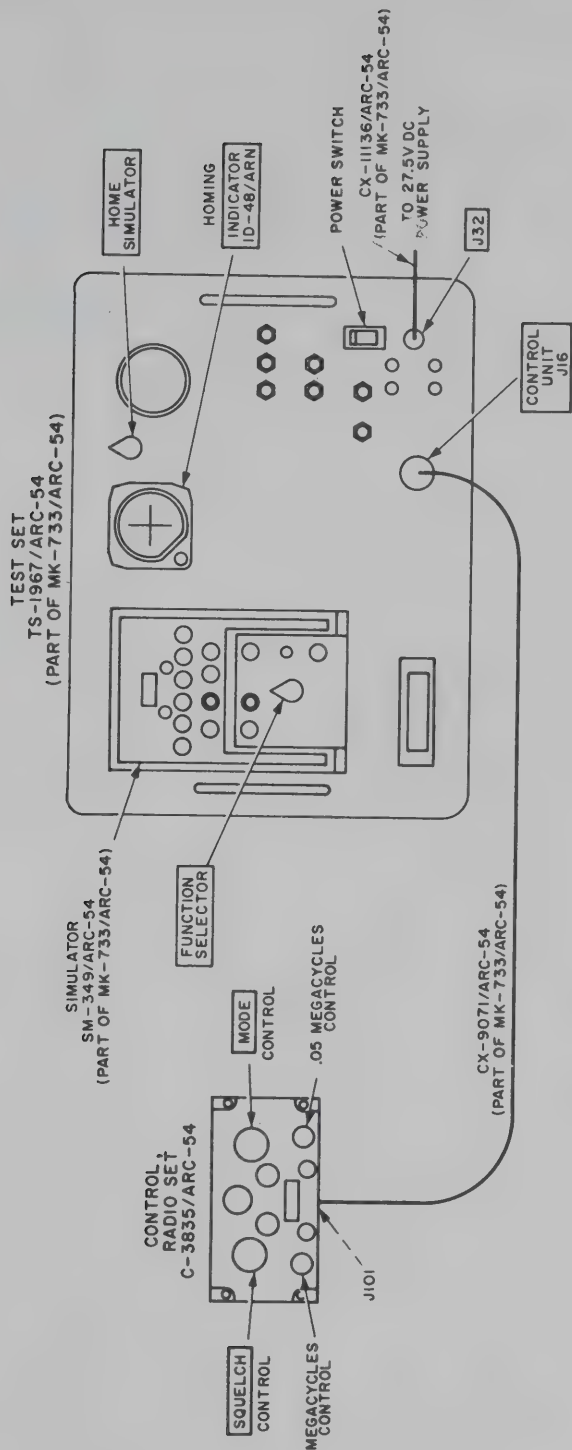
TM5821-244-35-59

Section III. CONTROL, RADIO SET C-3835/ARC-54 FINAL TESTS

5-18. Control Unit Frequency Selection and Panel Lamps Test

- a. *Test Equipment and Materials.* Maintenance Kit, Electronic Equipment MK-733/ARC-54.
 b. *Test Connections and Conditions.* Connect the equipment as shown in figure 5-13.
 c. *Procedure.*

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	<i>TS-1967/ARC-54</i> S6: RCV. POWER circuit breaker: ON. S10: SM. S11: CONT UNIT. SM-349/ARC-54 S1: OFF. S2: ON. S3: OFF.	Mode control: PTT. Megacycle control: Set as instructed in <i>Test procedure</i> column. Squelch control: set to CARRIER.	Beginning at 30 megacycles, successively select each megacycle setting on control unit.	Frequency counter on SM-349/ARC-54 should agree with frequency selected on control unit. Also, for even-megacycle settings, EVEN MC lamp on SM-349/ARC-54 should light, and ODD MC lamp should be extinguished. Note also, that control unit panel lamps light when TS-1967/ARC-54 POWER circuit breaker is at ON and S11 is set to CONT UNIT.
2	Leave controls as in step 1, except: <i>TS-1967/ARC-54</i> S12: AN COUPLER.	Same as step 1.	Repeat step 1.	Same as step 1.
3	Leave controls as in step 2 except: <i>TS-1967/ARC-54</i> S6: XMIT. S12: RADIO.	Same as step 1.	Repeat step 1.	Same as step 1, plus: For all frequency settings from 30 through 45 megacycles, SM-349/ARC-54 HAR FIL lamp should light. For all frequency settings from 46 through 69 megacycles, HAR FIL lamp should not light.
4	Leave controls as in step 3, except: <i>TS-1967/ARC-54</i> S6: RCV.	Mode control: PTT. 0.05 megacycles selectors: Set as instructed in <i>Test procedure</i> column.	Beginning at 0.00 megacycles, successively select each 0.05-megacycle setting on control unit.	Frequency counter on SM-349/ARC-54 should agree with frequency selected on control unit.



NOTE: INDICATES EQUIPMENT MARKING

TM5821-244-35-136

Figure 5-14. Control unit homing circuit test setup.

5-19. Control Unit Homing Test

- a. *Test Equipment and Materials.* Maintenance Kit, Electronic Equipment MK-733/ARC-54.
 b. *Test Connections and Conditions.* Connect the equipment as shown in figure 5-14.
 c. *Procedure.*

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	<i>TS-1967/ARC-54</i> S6: RCV. S10: SIM. S11: CONT UNIT. S12: RADIO. All other switches: Any position. POWER circuit breaker: ON. <i>SM-349/ARC-54</i> S1: RETRAN CARR. S2: ON. S3: OFF.	Mode control: HOME. SQUELCH: CARR.	a. Observe flags on ID-48/ARN (part of TS-1967/ARC-54). b. Observe HOME lamp on SM-349/ARC-54.	a. Flags actuate when control unit mode control is set to HOME. b. HOME lamp lights when control unit mode control is set to HOME.
2	Leave controls as in step 1, except: <i>SM-349/ARC-54</i> S3: LEFT.	Same as step 1.	Observe vertical needle on ID-48/ARN.	Vertical needle on ID-48/ARN should swing left.
3	Leave controls as in step 1, except: 1. <i>SM-349/ARC-54</i> S3: RIGHT	Same as step 1.	Same as step 2.	Vertical needle on ID-48/ARN should swing right.
4	Leave controls as in step 1, except: <i>SM-349/ARC-54</i> S3: OVER TGT.	Same as step 1.	Observe horizontal needle on ID-48/ARN.	Horizontal needle on ID-48/ARN should swing down. Vertical needle should center.

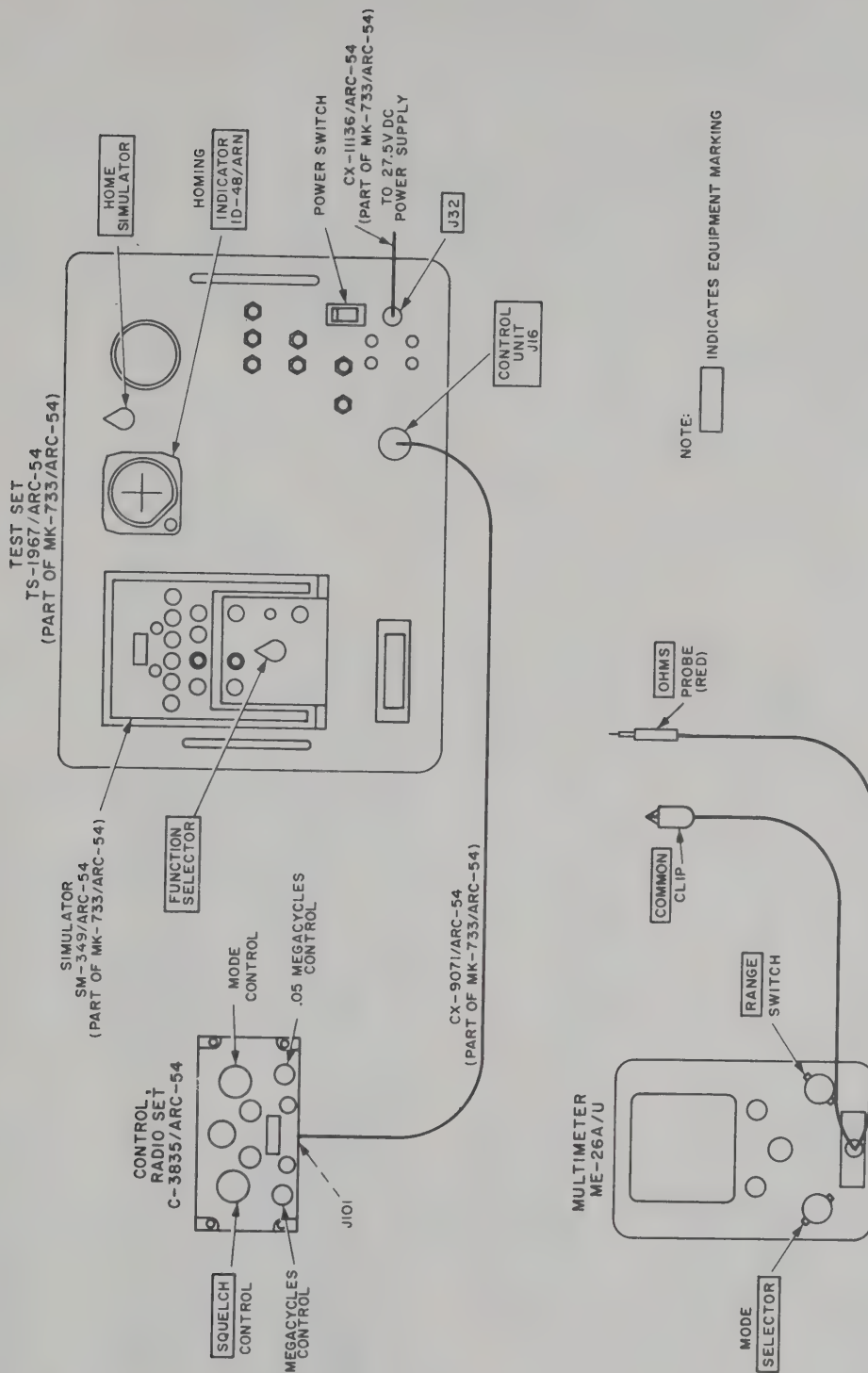


Figure 5-15. Control unit audio, PTT, and squelch circuits, test setup.

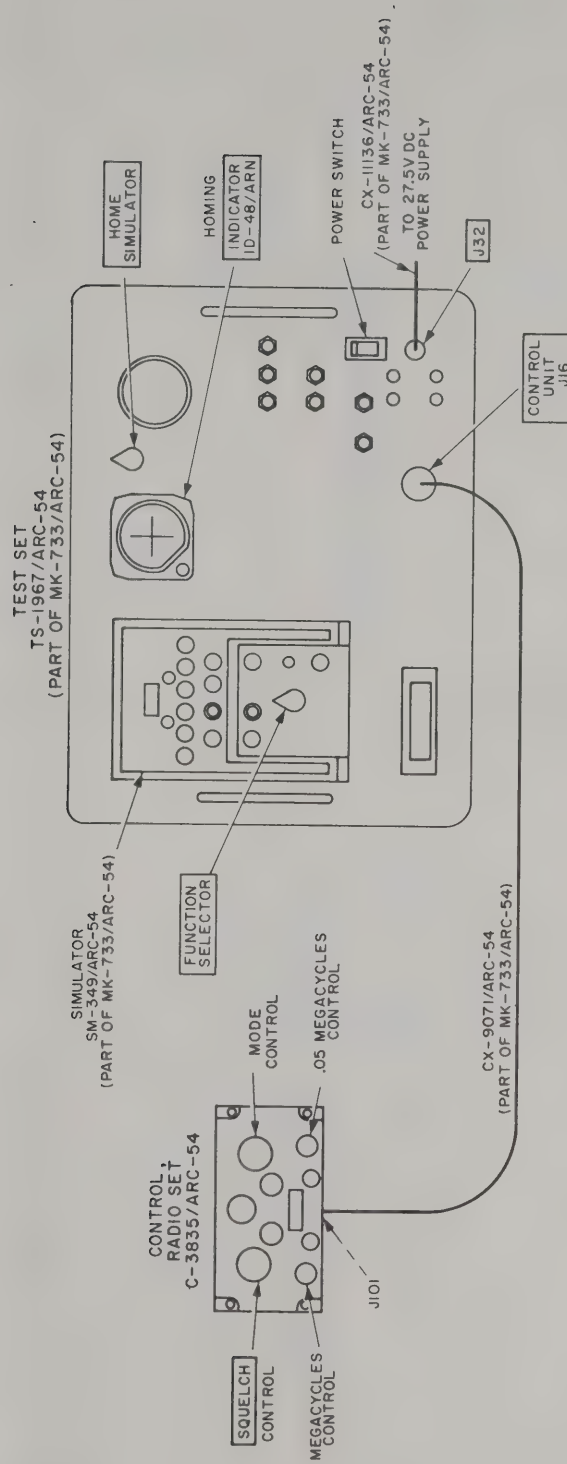
5-20. Control Unit Audio, PTT, and Squelch Circuits, Continuity Test*a. Test Equipment and Materials.*

Maintenance Kit, Electronic Equipment MK-733/ARC-54.

Multimeter ME-26A/U.

b. Test Connections and Materials. Connect the equipment as shown in figure 5-15.*c. Procedure.*

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	<i>TS-1967/ARC-54</i> S6: XMIT. S10: SIM. S11: CONT UNIT. S12: RADIO. All other switches: Any position. POWER circuit breaker: OFF. <i>SM-349/ARC-54</i> S1: OFF. S2: ON. S3: OFF.	Mode control: PTT.	Connect multimeter to test jacks J18 and J31 on TS-1967/ARC-54 and check for continuity.	Continuity should exist between J18 and J31.
2	Leave controls as in step 1, except: <i>TS-1967/ARC-54</i> S6: RCV.	Same as step 1.	a. Connect multimeter to test jacks J24 and J25, and check for continuity. b. Connect multimeter to test jacks J21 and J31, and check for continuity. c. Connect multimeter between test jacks J28 and J31, and measure resistance. d. Connect multimeter to test jacks J30 and J31, and observe resistance while rotating VOL (volume) control on control unit.	a. Continuity should exist between J24 and J25. b. Continuity should exist between J21 and J31. c. Resistance between J28 and J31 should be approximately 162 ohms ± 32. d. Resistance between J30 and J31 should vary between 12 ohms ± 2 and 162 ohms ± 32 as VOL control unit is varied.
3	Leave controls as in step 2.	Mode control: RETRAN.	Connect multimeter to test jacks J26 and J29, and check for continuity.	Continuity should exist between J26 and J29.
4	Leave controls as in step 3, except: <i>TS-1967/ARC-54</i> POWER circuit breaker: ON.	SQUELCH control: Set as instructed in <i>Test procedure</i> column. Mode control: PTT.	Set SQUELCH control on control unit to each of its three positions and observe SQUELCH lamps on SM-349/ARC-54. NOTE: Delete TONE position on models having TONE position blocked.	When SQUELCH control is set to CARR, CARR lamp should light. When SQUELCH control is set to TONE, TONE lamp should light. When SQUELCH control is set to DIS, both CARR and SEC lamps should light.



NOTE: INDICATES EQUIPMENT MARKING

TM5821-244-35-138

Figure 5-16. Control unit retransmit circuits, test setup.

5-21. Retransmit Circuit Test*a. Test Equipment and Materials.*

Maintenance Kit, Electronic Equipment MK-733/ARC-54.

Multimeter ME-26A/U.

b. Test Connections and Conditions. Connect the equipment as shown in figure 5-16.*c. Procedure.*

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	<i>TS-1967/ARC-54</i> S6: XMIT. S10: SIM. S11: CONT UNIT. S12: RADIO. All other switches: Any position. POWER circuit breaker: OFF. <i>SM-349/ARC-54</i> S1: OFF. S3: OFF. S2: ON.	Mode control: RETRAN.	Connect multimeter to test jacks J22 and J31, and check for continuity.	Continuity should exist between J22 and J31.
2	Leave controls as in step 1, except: <i>TS-1967/ARC-54</i> S6: RCV <i>SM-349/ARC-54</i> S1: RETRAN CARR	Mode control: RETRAN. SQUELCH control: CARR.	Connect multimeter to test jacks J17 and J31, and check for continuity.	Continuity should exist between J17 and J31.
3	Leave controls as in step 2, except: <i>SM-349/ARC-54</i> S1: RETRAN TONE	Mode control: RETRAN. SQUELCH control: TONE.	a. Connect multimeter to test jacks J17 and J31, and check for continuity. b. Connect multimeter to test jacks J28 and J19, and check for continuity. c. Connect multimeter to test jacks J26 and J31, and check for continuity. d. Connect multimeter to test jacks J23 and J31, and check for continuity. e. Connect multimeter to test jacks J20 and J24, and measure resistance.	a. Continuity should exist between J17 and J31. b. Continuity should exist between J28 and J19. c. Continuity should exist between J26 and J31. d. Continuity should exist between J23 and J31. e. Resistance of 330 ohms $\pm$ 33 should be measured between J20 and J24.

NOTE: Disregard step 3 when testing units with TONE position blocked.



Section IV. GENERAL SUPPORT TESTING, ANTENNA COUPLERS CU-942/ARC-54 and CU-943/ARC-54

5-22. Antenna Coupler Tests

a. Test Equipment and Materials.

Maintenance Kit, Electronic Equipment MK-733/ARC-54.

Signal Generator AN/USM-44A.

Frequency Meter AN/USM-26.

Admittance Meter, General Radio Model 1602B.

Radio Interference Measuring Set AN/URM-85 with Converter CV-1102/URM-85.

b. Test Connections and Conditions. Connect the equipment as shown in figure 5-17.

c. Procedure.

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	<i>TS-1967/ARC-54</i> S1: ON COURSE. S2: FWD. S3: 50. S4: 0. S5: 0.50. S6: RCV. S7: DIS. S8: TONE. S9: PTT. S10: ANT COUPLER. S11: TEST SET. S12: ANT COUPLER. POWER circuit breaker: ON. <i>AN/USM-44A</i> FREQUENCY RANGE: C. FREQ control: Set to 50 mc. MOD SELECTOR: CW. Attenuator dial: Minimum attenuation. <i>AN/USM-26</i> FREQUENCY SELECTOR: Set to FREQUENCY. FREQUENCY UNIT: 1. <i>CV-394/USA-5</i> (p/o AN/USM-26) RANGE-MC: 40-100.	None.	a. Rotate AN/USM-44A OUTPUT LEVEL control fully clockwise. b. Set AN/USM-26 GAIN control to MAX and tune TUNING dial for maximum closure of tuning eye. Decrease GAIN setting as necessary to prevent complete closure of tuning eye. c. Set AN/USM-26 MIXING FREQUENCY MCS switch to 50 and tune AN/USM-44A FINE FREQ ADJUST for reading on AN/USM-26 counters of 500 kc ± 1 (actually 50.500 mc ± 0.001). d. Tune AN/URM-85 TUNING dial for maximum indication on MICROVOLTS meter. e. Tune GR1602B susceptance and conductance adjustments (fig. 5-17) for null (minimum indication) on AN/URM-85 MICROVOLTS meter. f. Note setting of susceptance and conductance adjustments. If readings are not correct, set susceptance and conductance adjustments to correct values and adjust the CY-942/	a. None. b. None. c. None. d. None. e. None. f. Susceptance and conductance settings should be as indicated in appropriate chart (para 5-23).

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
	MIXING FREQUENCY MCS: TUNE. TUNING: Set as instructed in Test procedure column. GAIN: Set as instructed in Test procedure column. <i>AN/URM-85</i> Function switch: CW AVERAGE. Calibration switch: SERIES CAL & OPERATE. SIGNAL ATTENUATOR DB: Set to 40. Decrease setting (after tuning AN/USM-44A) as necessary for convenient meter indication. <i>Tuning unit 2</i> (p/o AN/URM-85) FREQUENCY RANGE-MC: 20-70. GAIN: Set for convenient reading on meter. TUNING: Tune to 50.50 mc. <i>GR1602B</i> Frequency adjustment: Set to 50.50. Susceptance adjustment: Set as directed in Test procedure column. Conductance adjustment: Set as directed in Test procedure column. MULTIPLYING FACTOR: Set to 2.		ARC or CU-943/ARC coil that corresponds to test frequency (50.50 mc in this case) for null on AN/URM-85 MICRO-VOLTS meter. See figure 5-17, detail A, for coil identification. Make adjustment by squeezing or stretching turns of coil. Caution: Do not exert strain on switch contacts; they break easily. g. Repeat a through f above at each frequency listed in charts (para 5-23). Refer to charts for correct reading on each frequency. <i>Note.</i> For all frequencies below 41.50 mc, set GR1602B to 42 mc. Leave MULTIPLIER set to 2 for all checks. <i>Note.</i> Perform tests beginning at 50.50 mc and proceeding down in frequency until lowest test frequency (30.50 mc) is checked. Next, start at 51.50 mc and proceed up in frequency until all test frequencies have been checked. By testing in this sequence, you will be able to tune proper coil (when necessary) as individual coils are added to circuit successively when antenna coupler is tuned away from 50.50 megacycles toward either end of frequency band. After replacing or tuning any coil, recheck all frequencies between adjusted-coil frequency and 50.50 megacycles. After replacing any capacitor, check tuning of both coils that connect to same switch contact as replaced capacitor.	g. See charts below for correct readings for each frequency.

5-23. Conductance and Susceptance Charts

a. Antenna Coupler CU-942/ARC-54.

Frequency (mc)	Conductance		Susceptance	
	From-	To-	From-	To-
30.50.....	0.2	1.5	13.1	15.5
31.50.....	0.1	1.4	13.0	15.4
32.50.....	0.2	1.5	13.3	15.7
33.50.....	0.2	1.5	13.0	15.4
34.50.....	0.6	1.8	12.4	14.8
35.50.....	0.2	1.5	12.2	14.6
36.50.....	0.2	1.5	11.8	14.2
37.50.....	0.3	1.6	11.5	13.9
38.50.....	0.5	1.5	10.6	13.0
39.50.....	0.6	1.8	10.1	12.5
40.50.....	0.9	2.9	9.9	12.3
41.50.....	1.4	3.4	9.5	11.9
42.50.....	1.5	3.5	8.5	10.5
43.50.....	2.2	4.2	8.1	10.1
44.50.....	3.5	5.5	6.7	8.7
45.50.....	4.0	6.0	5.2	7.2
46.50.....	4.7	6.7	3.9	5.6
47.50.....	6.0	7.8	2.6	4.1
48.50.....	6.6	8.0	1.1	2.5
49.50.....	6.2	8.2	-0.4	2.0
50.50.....	6.3	8.7	-2.3	-3.7
51.50.....	6.2	8.0	-2.9	-4.7
52.50.....	6.4	8.2	-4.3	-6.0
53.50.....	6.3	8.3	-5.3	-7.0
54.50.....	6.5	8.2	-6.3	-8.5
55.50.....	6.0	8.0	-7.5	-9.9
56.50.....	6.3	8.2	-8.9	-10.3
57.50.....	5.8	7.8	-10.0	-12.0
58.50.....	5.9	7.7	-10.5	-12.5
59.50.....	5.7	7.7	-10.7	-12.7
60.50.....	6.3	8.7	-12.8	-15.0
61.50.....	5.8	8.0	-12.7	-14.7
62.50.....	5.6	7.3	-11	-14.7
63.50.....	4.9	6.8	-12.3	-14.3
64.50.....	4.4	6.4	-11.5	-13.5
65.50.....	4.4	6.3	-12.3	-14.3
66.50.....	3.7	5.5	-11.5	-13.5
67.50.....	3.3	5.4	-11.0	-13.0
68.50.....	2.6	4.0	-9.9	-11.9
69.50.....	2.6	4.8	-9.9	-12.0

b. Antenna Coupler CU-943/ARC-54.

Frequency (mc)	Conductance		Susceptance	
	From—	To—	From—	To—
30.50-----	0.1	1.0	13.8	16.2
31.50-----	0.1	1.0	14.0	16.4
32.50-----	0.2	1.2	14.0	16.4
33.50-----	0.3	1.4	14.1	16.5
34.50-----	0.5	2.3	13.5	15.9
35.50-----	0.4	2.0	13.2	15.6
36.50-----	0.6	2.5	12.5	14.9
37.50-----	0.5	2.3	11.9	14.3
38.50-----	0.4	2.0	11.0	13.4
39.50-----	0.9	1.3	10.4	12.8
40.50-----	1.5	2.9	9.9	12.3
41.50-----	2.0	3.0	9.9	12.3
42.50-----	2.3	3.7	9.9	12.3
43.50-----	2.9	4.3	8.0	9.4
44.50-----	4.3	5.7	7.1	8.5
45.50-----	4.8	6.2	5.3	6.7
46.50-----	5.6	7.0	4.3	5.7
47.50-----	6.5	7.9	2.8	4.2
48.50-----	6.8	8.2	0.9	2.3
49.50-----	6.6	8.0	0.2	-1.2
50.50-----	7.1	8.5	-1.8	-3.2
51.50-----	7.1	8.5	-2.5	-3.9
52.50-----	7.0	8.4	-4.1	-5.5
53.50-----	6.7	8.1	-5.3	-6.7
54.50-----	6.6	8.0	-6.5	-7.9
55.50-----	6.3	7.7	-7.8	-9.2
56.50-----	6.1	7.5	-9.2	-10.2
57.50-----	5.7	6.1	-10.3	-11.7
58.50-----	5.0	6.4	-10.8	-12.2
59.50-----	5.1	6.5	-11.0	-12.4
60.50-----	5.9	7.3	-13.5	-14.9
61.50-----	5.4	6.8	-13.0	-14.4
62.50-----	4.9	6.3	-13.1	-14.5
63.50-----	4.6	6.0	-12.8	-14.2
64.50-----	3.8	5.2	-11.8	-13.2
65.50-----	3.9	5.3	-12.7	-14.1
66.50-----	3.2	4.6	-11.7	-13.1
67.50-----	2.8	4.2	-10.8	-12.2
68.50-----	2.3	3.7	-10.0	-11.4
69.50-----	2.3	3.7	-10.1	-11.5

c. Antenna Coupler CU-942A/ARC-54.

Frequency (mc)	Conductance		Susceptance	
	From-	To-	From-	To-
30.50	0.2	1.5	12.2	14.2
31.50	0.1	1.4	12.2	14.2
32.50	0.2	1.5	12.3	14.3
33.50	0.2	1.5	12.6	14.6
34.50	0.2	1.8	12.2	14.2
35.50	0.2	1.5	12.1	14.1
36.50	0.2	1.5	11.75	13.75
37.50	0.3	1.6	11.3	13.3
38.50	0.5	1.5	11.1	13.1
39.50	0.6	1.8	10.6	12.6
40.50	0.9	2.9	10.0	12.0
41.50	1.1	3.4	8.95	10.95
42.50	1.5	3.5	8.1	10.1
43.50	2.0	4.0	7.55	9.2
44.50	3.0	5.0	6.7	8.1
45.50	5.0	7.0	6.0	7.1
46.50	5.7	7.7	4.5	5.9
47.50	7.6	9.6	3.7	6.3
48.50	8.2	10.2	2.0	3.4
49.50	8.2	10.2	0.9	2.0
50.50	8.2	10.2	-2.7	-4.0
51.50	8.2	10.2	-4.5	-5.8
52.50	8.8	10.8	-7.1	-9.0
53.50	8.9	10.9	-9.2	-11.3
54.50	8.7	10.7	-11.7	-13.7
55.50	7.6	9.6	-12.4	-14.4
56.50	7.5	9.5	-14.0	-16.2
57.50	7.0	9.2	-15.0	-17.0
58.50	6.0	8.0	-15.4	-17.9
59.50	5.4	7.5	-15.9	-17.9
60.50	5.5	7.5	-16.8	-18.8
61.50	4.8	6.8	-16.1	-18.0
62.50	5.0	7.0	-16.7	-18.7
63.50	4.7	6.7	-17.0	-19.0
64.50	4.1	6.1	-16.5	-18.5
65.50	3.2	5.7	-15.8	-17.8
66.50	3.3	4.8	-15.3	-17.3
67.50	3.2	4.7	-15.4	-17.4
68.50	2.6	4.1	-14.3	-16.3
69.50	2.1	4.5	-13.2	-15.3

Section V. SUMMARY OF TEST DATA

5-24. Summary of Test Data for Receiver-Transmitter, Radio RT-348/ARC-54

Test	Performance standard		Test	Performance standard	
1. TEST METER TESTS:	<i>Switch position</i>	<i>Reading</i>	6. TRANSMITTER CARRIER NOISE.	31.00 mc: -40 db or more.	
a. Receive mode.	1-4	50 $\pm$ 30		50.50 mc: -40 db or more.	
	5	NMT 20 (avg)		68.95 mc: -40 db or more.	
	6	50 $\pm$ 30			
	7-11	NMT 5	7. RECEIVER SENSITIVITY QUIETING AND LIMITING.	31 mc	1.2 μ v: -10 db or more.
b. Transmit mode.	1-6	50 $\pm$ 30			120 μ v: -40 db or more.
	7	NLT 5			6 to 10,000 μ v: 2 db max change.
	8	NLT 20		50.50 mc	1.2 μ v: -10 db or more.
	9	50 $\pm$ 30			120 μ v: -40 db or more.
	10	NLT 20			6 to 10,000 μ v: 2 db max change.
	11	NMT 10		68.95 mc	1.2 μ v: -10 db or more.
c. Receive mode (jumper removed).	11	NLT 20			120 μ v: -40 db or more.
					6 to 10,000 μ v: 2 db max change.
2. AUDIO OUTPUT AND DISTORTION.	31 mc modulated $\pm$ 10 kc at 1 kc: 2.73 volts rms.		8. RECEIVER SQUELCH ADJUSTMENT.	31 mc	SQ ADJ clockwise: 6 μ v or less should unsquelch the receiver.
	31 mc modulated $\pm$ 10 kc at 300 cps: 1.93-3.06 volts rms.				0.6 μ v input: -45 (from 6- μ v input level).
	31 mc modulated $\pm$ 10 kc at 6 kc: 1.93-3.06 volts rms.				Difference between squelch and unsquelch: 0.6 μ v or less.
	50.50 mc modulated $\pm$ 10 kc at 1 kc: 2.73 volts rms.			50.50 mc	0.6 μ v input: -45 db (from 6- μ v input level).
	50.50 mc modulated $\pm$ 10 kc at 300 cps: 1.93-3.06 volts rms.				Difference between squelch and unsquelch: 0.6 μ v or less.
	50.50 mc modulated $\pm$ 10 kc at 6 kc: 1.93-3.06 volts rms.			68.95 mc	0.6 μ v input: -45 db (from 6- μ v input level).
	Same as above for primary power inputs of 24 and 29 volts dc.				Difference between squelch and unsquelch: 0.6 μ v or less.
3. TRANSMITTER POWER OUTPUT.	10 watts or more at each of the following frequencies (mc):				
	30.00 40.25 50.50 60.75				
	32.05 42.30 52.55 62.80				
	34.10 44.35 54.60 64.85				
	36.15 46.40 56.65 66.90				
	38.20 48.45 58.70 68.95				
4. TRANSMITTER DISTORTION.	30 mc modulated $\pm$ 10 kc at 1 kc: Maximum distortion - 8%.				
5. TRANSMITTER TONE DEVIATION.	49.25 mc, 150-cps tone deviation: 3,000 cps $\pm$ 500. Tone frequency: 150 cps $\pm$ 3.				

5-25. Summary of Test Data for Control, Radio Set C-3835/ARC-54

Test	Performance standard
9. TONE SQUELCH.	31 mc modulated ± 3 kc at 150 cps, unsquelch: 1.2 μ v or less and squelch with modulation off. 50.50 mc: Same as above. 68.95 mc: Same as above. 120 μ v input, modulated ± 2.5 kc, audio varied from 145 to 155 cps: receiver remains unsquelched.
10. RECEIVER CENTER FREQUENCY.	31 mc ± 5 kc. 50.50 mc ± 5 kc. 68.95 mc ± 5 kc.
11. RECEIVER SELECTIV- ITY.	31 mc: 6 db below reference: minimum of 30 kc between frequencies. 60 db below reference: maximum of 55 kc between frequencies. 80 db below reference: maximum of 100 kc between frequencies. 50.50 mc: Same as above. 68.95 mc: Same as above.
12. HOMING-----	31 mc: Homer coarse: ID-48/ARN vertical pointer swings right, left, or center, in accordance with switch setting. Signal strength: ID-48/ARN horizontal pointer swings down with reduction of RF input level. Flags: ID-48/ARN flags actuate when switch is set to TONE. 50.50 mc: Same as above. 68.95 mc: Same as above. Repeat the above for primary power outputs of 24 and 29 volts dc.

Test	Performance standard																																				
1. FREQUENCY SELECTION AND PANEL LAMPS.	S12-RADIO: Frequency counters should agree. EVEN MC lamp lights for even megacycles. ODD MC lamp lights for odd megacycles. Panel lamps light when power is applied and test set circuit breaker is on. S12-ANT COUPLER: Same as above. S5-XMIT: Same as above plus HAR FIL lamp lights for frequencies below 46 mc; does not light above 45 mc. 0.05 megacycle: Counters should agree.																																				
2. HOMING TEST--	Mode control to HOME: flags actuate, HOME lamp actuates. S3—LEFT: Vertical needle swings left. S3—OVER TGT: Horizontal needle swings down.																																				
3. PTT AND SQUELCH CIRCUITS:	<table><tr><td></td><td colspan="2"><i>Continuity</i></td></tr><tr><td><i>a. PTT-----</i></td><td><i>a. Power OFF:</i></td><td><i>From To</i></td></tr><tr><td></td><td>PTT-XMIT:</td><td>J18 J31</td></tr><tr><td></td><td>PTT-RCV:</td><td>J24 J25</td></tr><tr><td></td><td></td><td>J21 J31</td></tr><tr><td></td><td>RETRAN:</td><td>J26 J29</td></tr><tr><td></td><td>(162 ohms $\pm$ 32)</td><td>J28 J31</td></tr><tr><td></td><td colspan="2">Rotating VOL control: resistance from J31 to J30 shall vary from 12 to 162 ohms.</td></tr><tr><td><i>b. SQUELCH----</i></td><td><i>b. Power ON:</i></td><td></td></tr><tr><td></td><td>PTT-CARR: CARR lamp lights.</td><td></td></tr><tr><td></td><td>PTT-TONE: TONE lamp lights.</td><td></td></tr><tr><td></td><td>PTT-DIS: CARR and SEC lamps light.</td><td></td></tr></table>		<i>Continuity</i>		<i>a. PTT-----</i>	<i>a. Power OFF:</i>	<i>From To</i>		PTT-XMIT:	J18 J31		PTT-RCV:	J24 J25			J21 J31		RETRAN:	J26 J29		(162 ohms $\pm$ 32)	J28 J31		Rotating VOL control: resistance from J31 to J30 shall vary from 12 to 162 ohms.		<i>b. SQUELCH----</i>	<i>b. Power ON:</i>			PTT-CARR: CARR lamp lights.			PTT-TONE: TONE lamp lights.			PTT-DIS: CARR and SEC lamps light.	
	<i>Continuity</i>																																				
<i>a. PTT-----</i>	<i>a. Power OFF:</i>	<i>From To</i>																																			
	PTT-XMIT:	J18 J31																																			
	PTT-RCV:	J24 J25																																			
		J21 J31																																			
	RETRAN:	J26 J29																																			
	(162 ohms $\pm$ 32)	J28 J31																																			
	Rotating VOL control: resistance from J31 to J30 shall vary from 12 to 162 ohms.																																				
<i>b. SQUELCH----</i>	<i>b. Power ON:</i>																																				
	PTT-CARR: CARR lamp lights.																																				
	PTT-TONE: TONE lamp lights.																																				
	PTT-DIS: CARR and SEC lamps light.																																				

Test	Performance standard	
4. RETRANSMIT CIRCUITS		<i>Continuity</i>
		<i>From To</i>
	Power OFF:	
	RETRAN- XMIT	J22 J31
	RETRAN- CARR-RCV:	J17 J31
	RETRAN- TONE-RCV:	J17 J31
	RETRAN- TONE-RCV:	J28 J19
	RETRAN- TONE-RCV:	J26 J31
	RETRAN- TONE-RCV:	J23 J31
	RETRAN- TONE-REV:	J20 J24
	(330 ohms ± 33).	

5-26. Summary of Test Data for Coupler, Antenna CU-942/ARC-54 (CU-943/ARC-54)

Test	Performance standard
ADMITTANCE AND MECHAN- ICAL TUNING.	See charts (paras. 5-23 and 5-24).

Section VI. DEPOT INSPECTION STANDARDS

5-27. Applicability of Depot Inspection Standards

a. The tests outlined in this section are designed to measure the performance capability of a repaired equipment. Equipment that is to be returned to stock should meet the standards given in these tests.

b. Applicable procedures of the Army depots performing these tests and the general standards for repaired electronic equipment given in TB SIG 355-1, TB SIG 355-2, and TB SIG 355-3 form a part of the requirements for testing this equipment.

5-28. Test Procedures

a. The test equipment and power required for depot inspection standards are the same as indicated in paragraph 5-2.

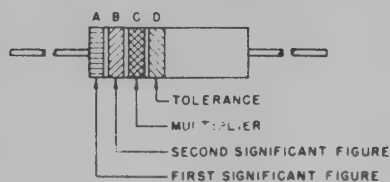
b. The operational tests for depot inspection standards are the same as the tests given in paragraphs 5-6 through 5-23. Perform the tests in the

order in which they are given, and observe that the results meet the minimum standard indicated in each test.

Tests	Paragraph
Test meter.....	5-6
Transmitter power output.....	5-7
Transmitter distortion.....	5-8
Transmitter tone deviation.....	5-9
Transmitter carrier noise.....	5-10
Audio output and distortion.....	5-11
Receiver sensitivity, quieting, and limiting.....	5-12
Receiver squelch adjustment.....	5-13
Tone squelch.....	5-14
Receiver center frequency.....	5-15
Receiver selectivity.....	5-16
Homing.....	5-17
Channel Changing.....	5-17
Control unit frequency selection and panel lamps.....	5-18
Control unit homing.....	5-19
Control unit audio, PTT, and squelch circuit continuity tests.....	5-20
Retransmit circuit.....	5-21
Antenna coupler.....	5-22

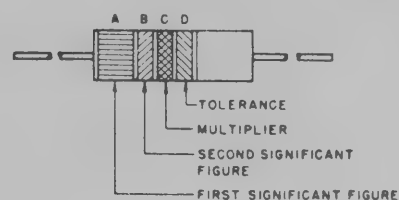
COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS

COMPOSITION-TYPE RESISTORS



BAND A—Equal Width Band
Signifies Composition-Type

WIREWOUND-TYPE RESISTORS

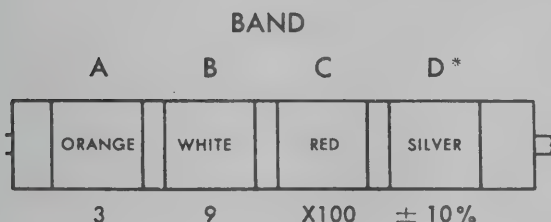


BAND A—Double Width Signifies
Wire-wound Resistor

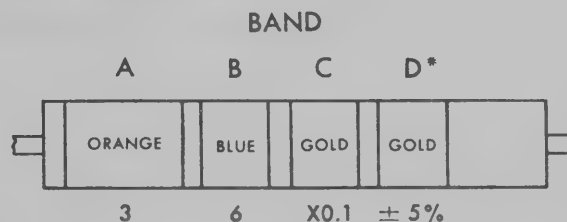
COLOR CODE TABLE

BAND A		BAND B		BAND C		BAND D*	
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)
BLACK	0	BLACK	0	BLACK	1		
BROWN	1	BROWN	1	BROWN	10		
RED	2	RED	2	RED	100		
ORANGE	3	ORANGE	3	ORANGE	1,000		
YELLOW	4	YELLOW	4	YELLOW	10,000	SILVER	± 10
GREEN	5	GREEN	5	GREEN	100,000	GOLD	± 5
BLUE	6	BLUE	6	BLUE	1,000,000		
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7				
GRAY	8	GRAY	8	SILVER	0.01		
WHITE	9	WHITE	9	GOLD	0.1		

EXAMPLES OF COLOR CODING



NOMINAL RESISTANCE 3,900 Ohms
RESISTANCE TOLERANCE ± 10 percent

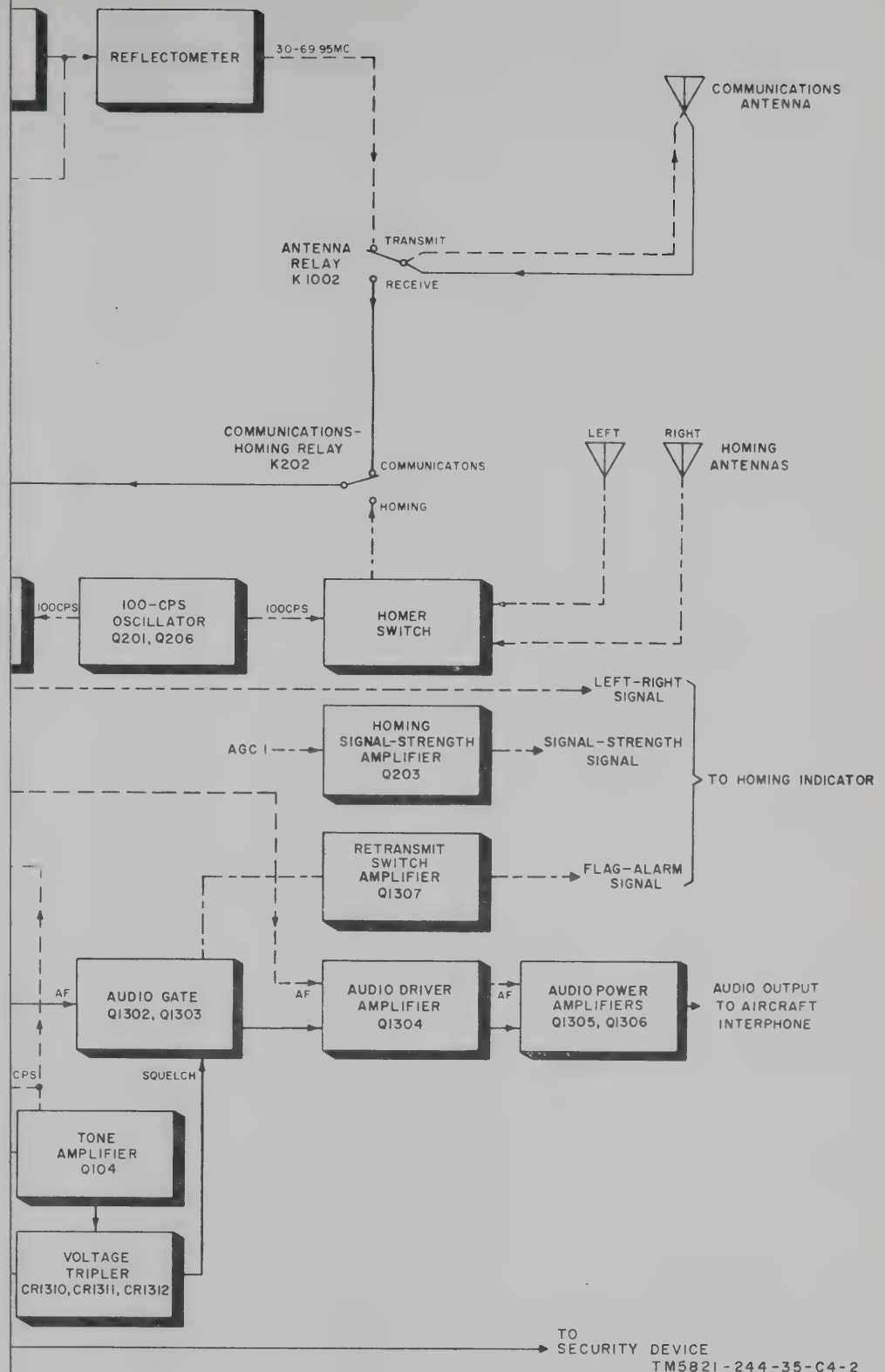


3.6 Ohms
± 5 percent

*If Band D is omitted, the resistor tolerance is ± 20%, and the resistor is not Mil-Std.

Figure 5-18. Color-code markings for MIL STD resistors.

STD-R2





- NOTES
1. DASHED LINES (---) INDICATE SIGNAL PATHS FOR TRANSMIT OPERATION
 2. SOLID LINES (—) INDICATE SIGNAL PATHS FOR RECEIVE OPERATION
 3. DASHED AND DOTTED LINES (---) INDICATE SIGNAL PATHS FOR HOMING OPERATION
 4. HEAVY SOLID LINES (—) INDICATE POWER DISTRIBUTION PATHS

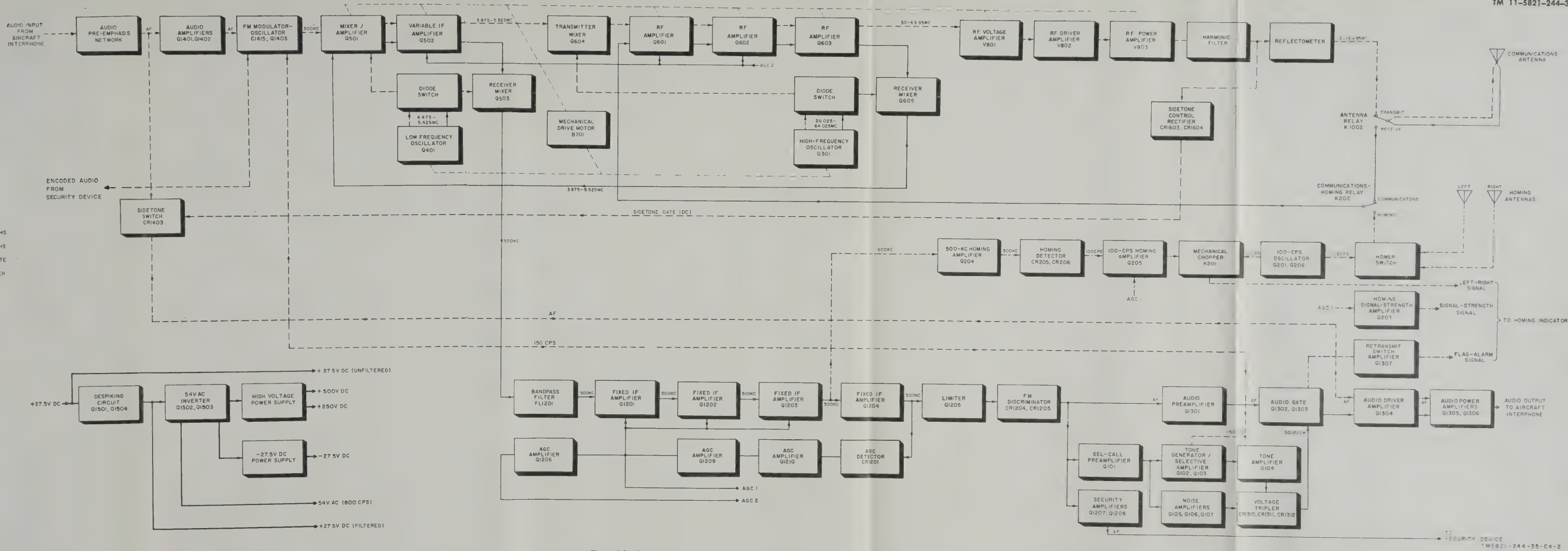
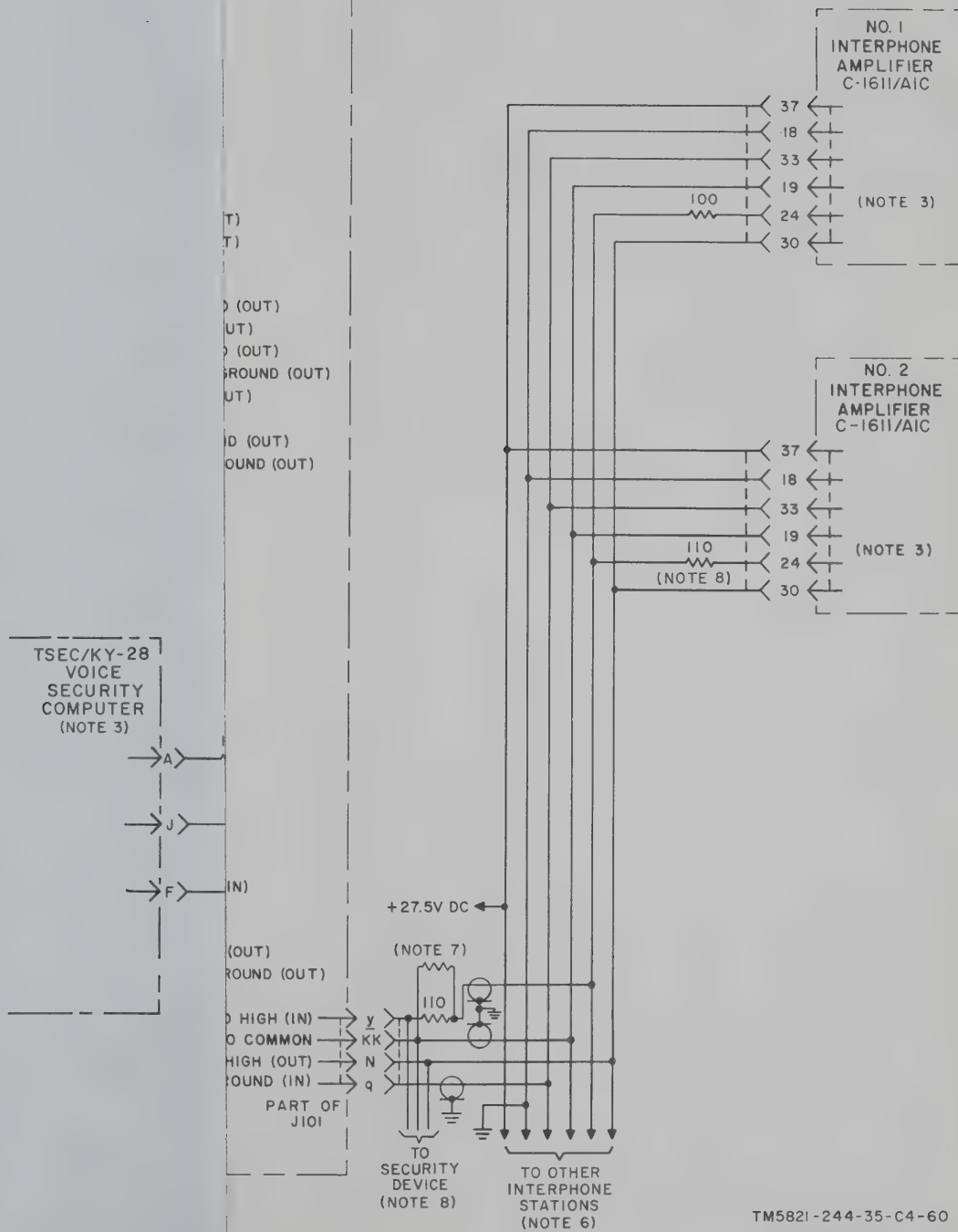
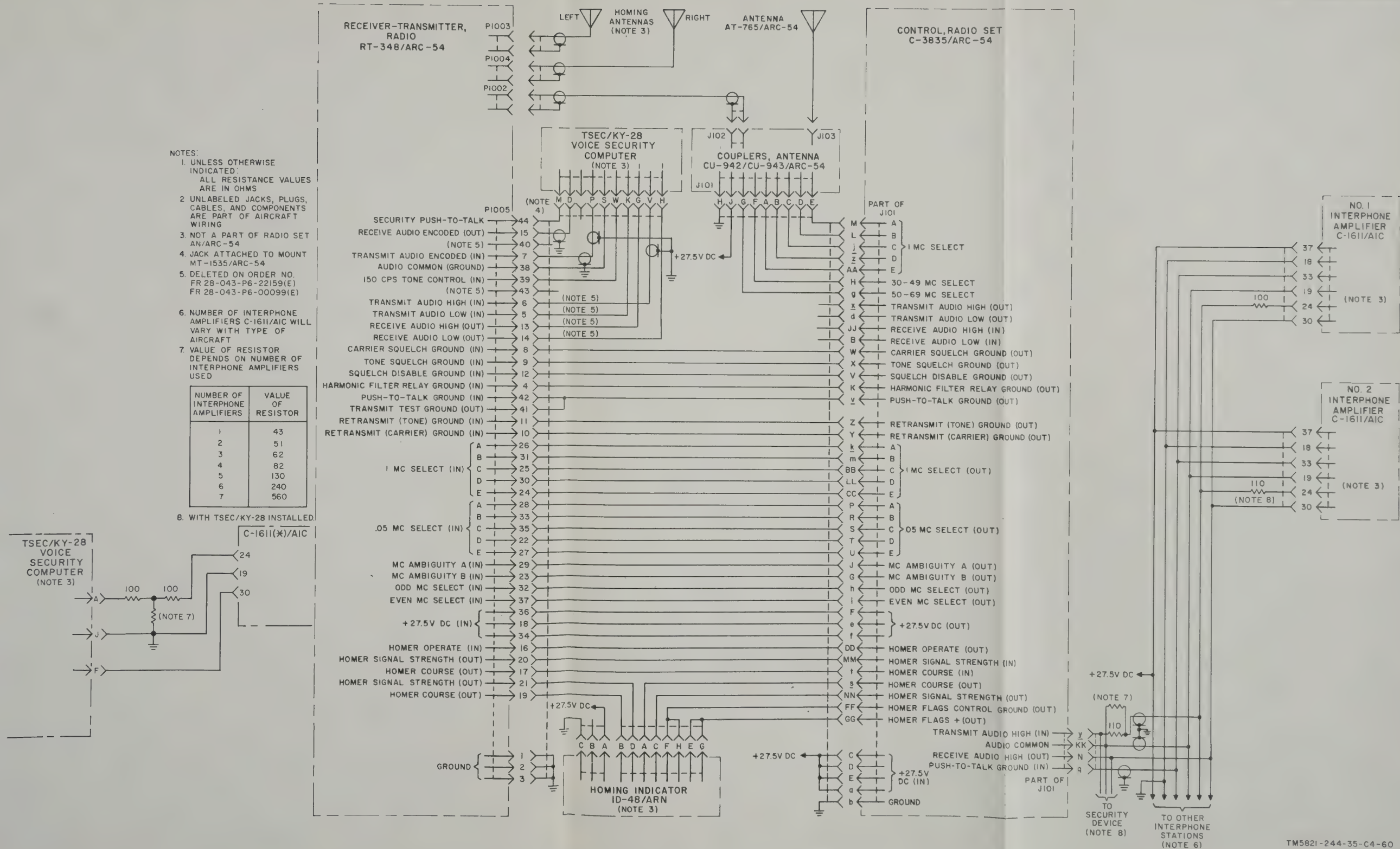
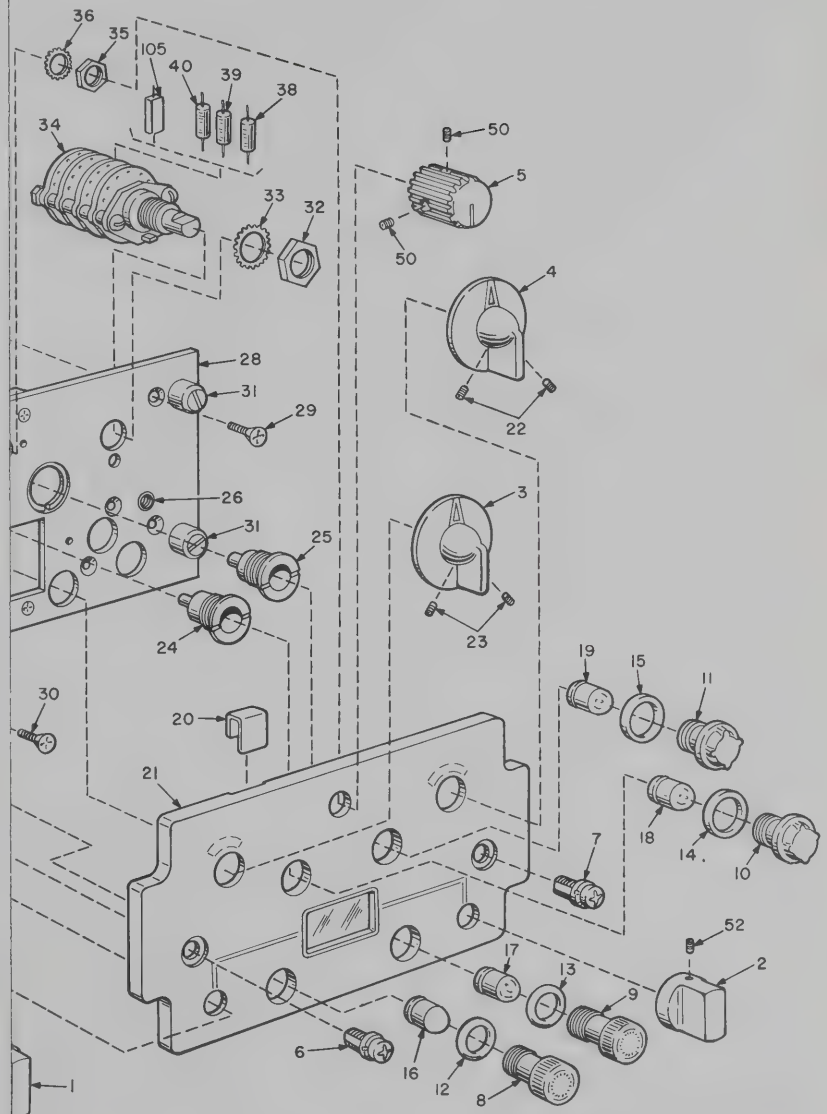


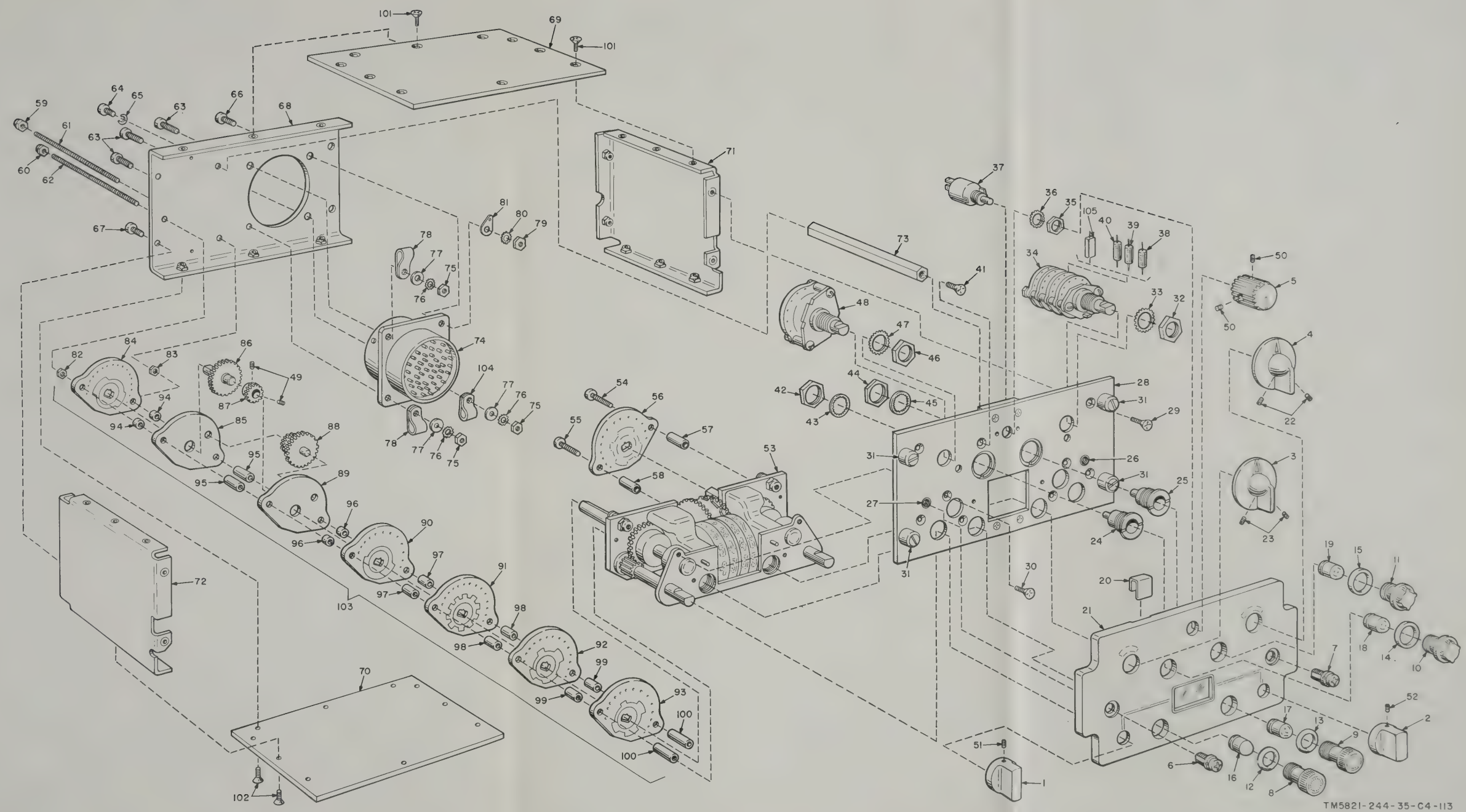
Figure 6-2. Receiver-Transmitter, Radio RT-348/ARC-54, block diagram.





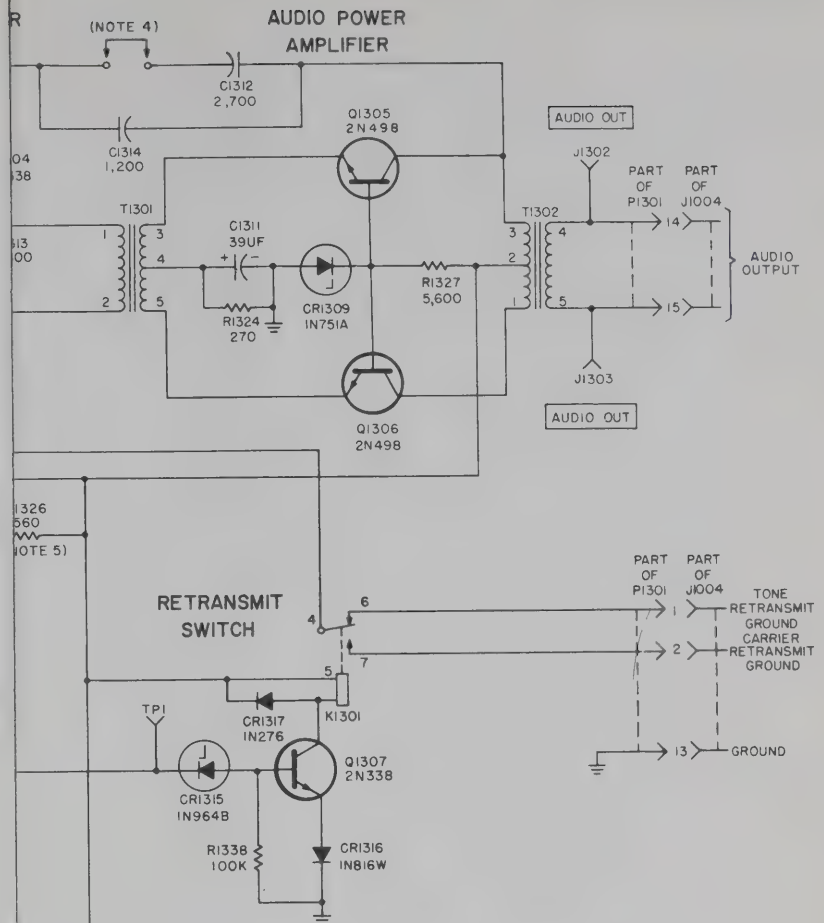


TM5821-244-35-C4-113



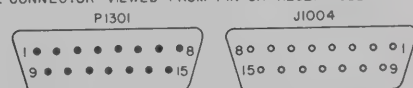
TM5821-244-35-C4-113

Figure 6-6. Control, Radio Set C-3835/ARC-54, exploded view.

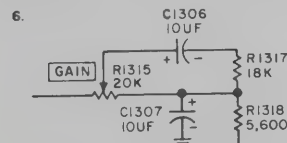


NOTES:

1. UNLESS OTHERWISE INDICATED:
ALL RESISTANCE VALUES ARE IN OHMS
ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
2. INDICATES EQUIPMENT MARKING
3. CONNECTOR VIEWED FROM PIN OR RECEPTACLE SIDE



4. JUMPER CONNECTED TO ENABLE DEEMPHASIS
5. R1339(3900 OHMS), R1331(1800 OHMS), AND R1326(1000 OHMS)
ON ORDER NO. FR-28-043-P6-00099(E)



ORDER NO. FR-28-043-P6-00099(E)

TM5821-244-35-C4-170

Change 4

6-19

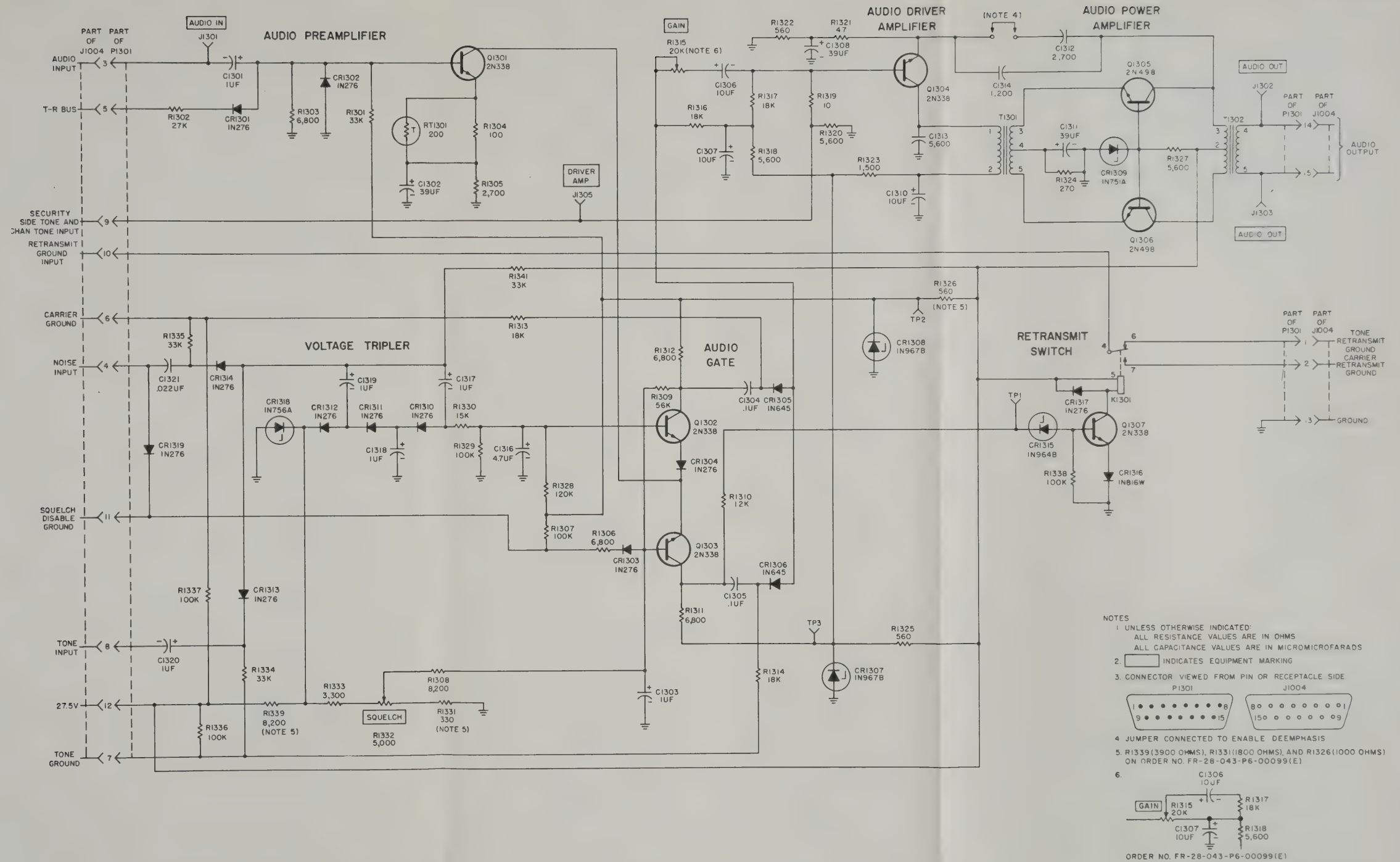
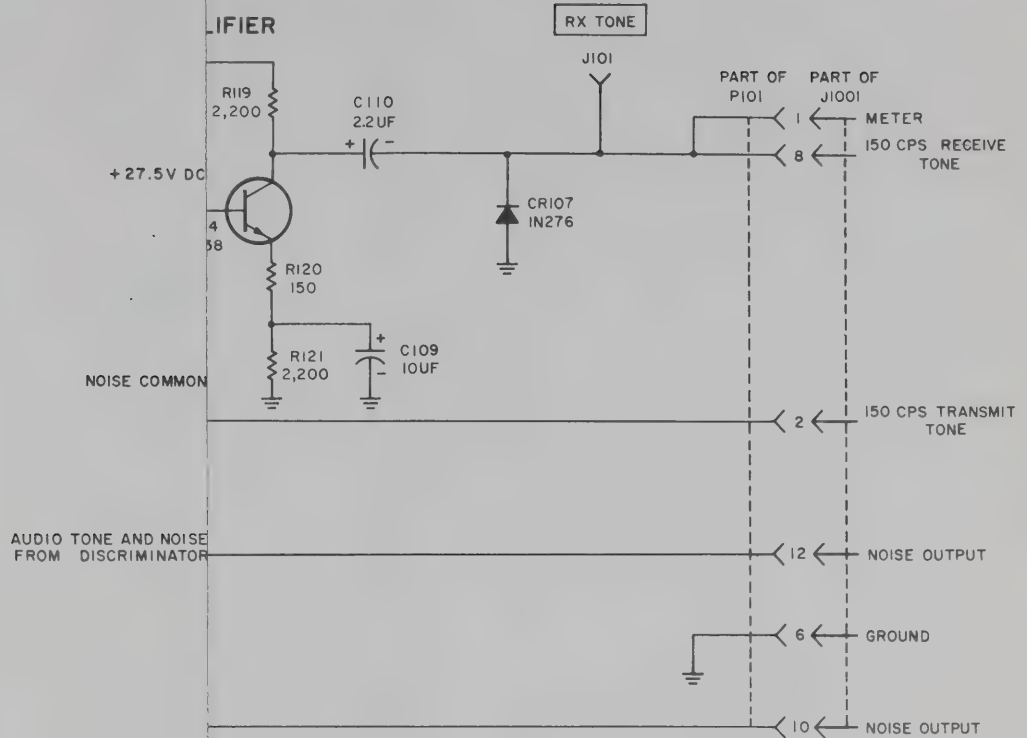


Figure 6-9. Receive Audio module, schematic diagram.

PA
J
TONE SQUELCH DISABLE

T-R BUS ± 27.5 V

NOTES:

1. UNLESS OTHERWISE INDICATED:
ALL RESISTANCE VALUES ARE IN OHMS
ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS

NOISE INPUT

2. [] INDICATES EQUIPMENT MARKING
3. CONNECTOR VIEWED FROM PIN OR RECEPTACLE SIDE.
- P101 J1001



4. R124 (200 OHMS) SERIAL NUMBERS TO 694 (ADMIRAL)
R124 (180 OHMS) ON ORDER NO. FR-28-043 - P5-00690(E)

TM5821-244-35-C4-172

Change 4

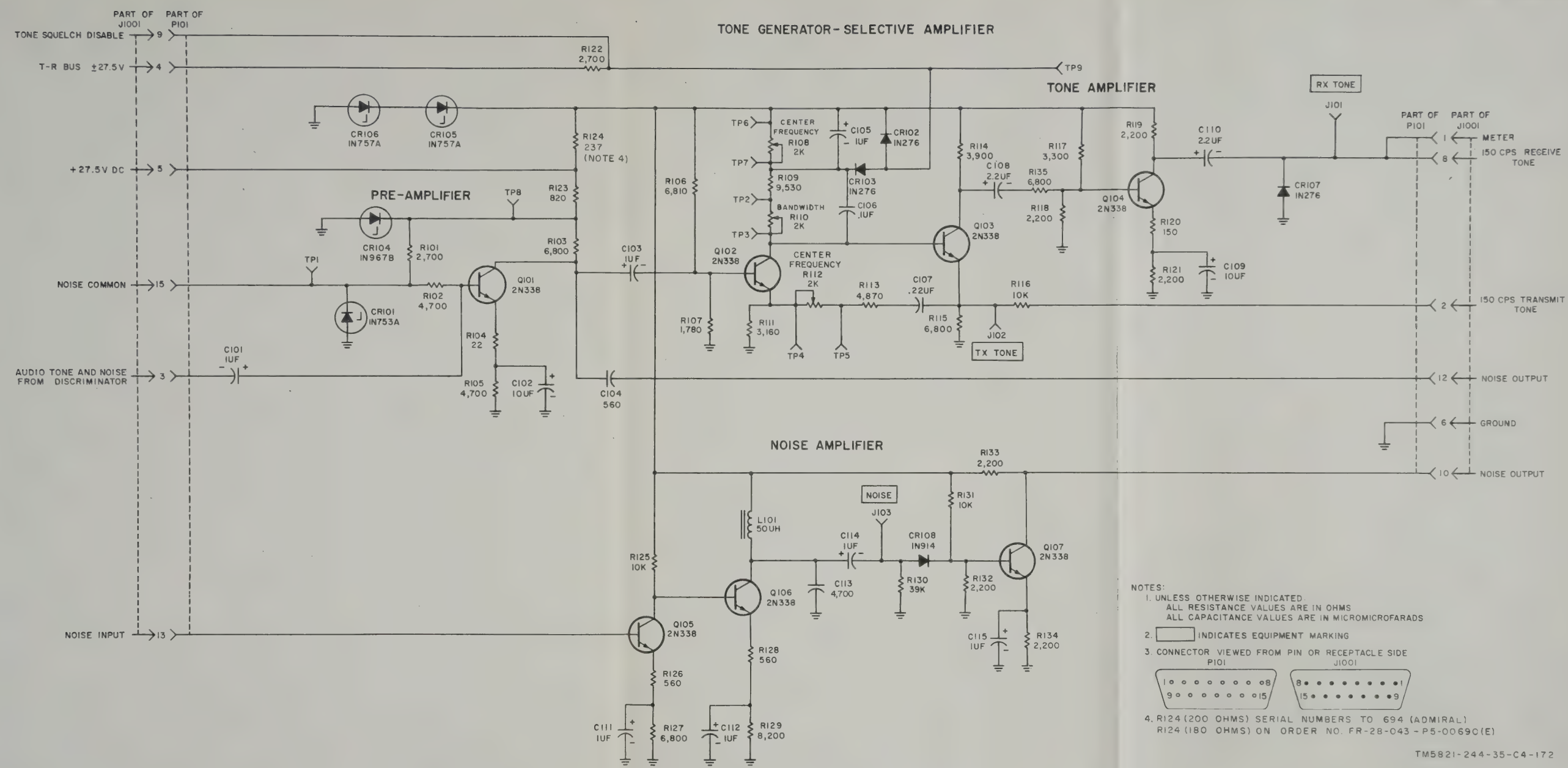
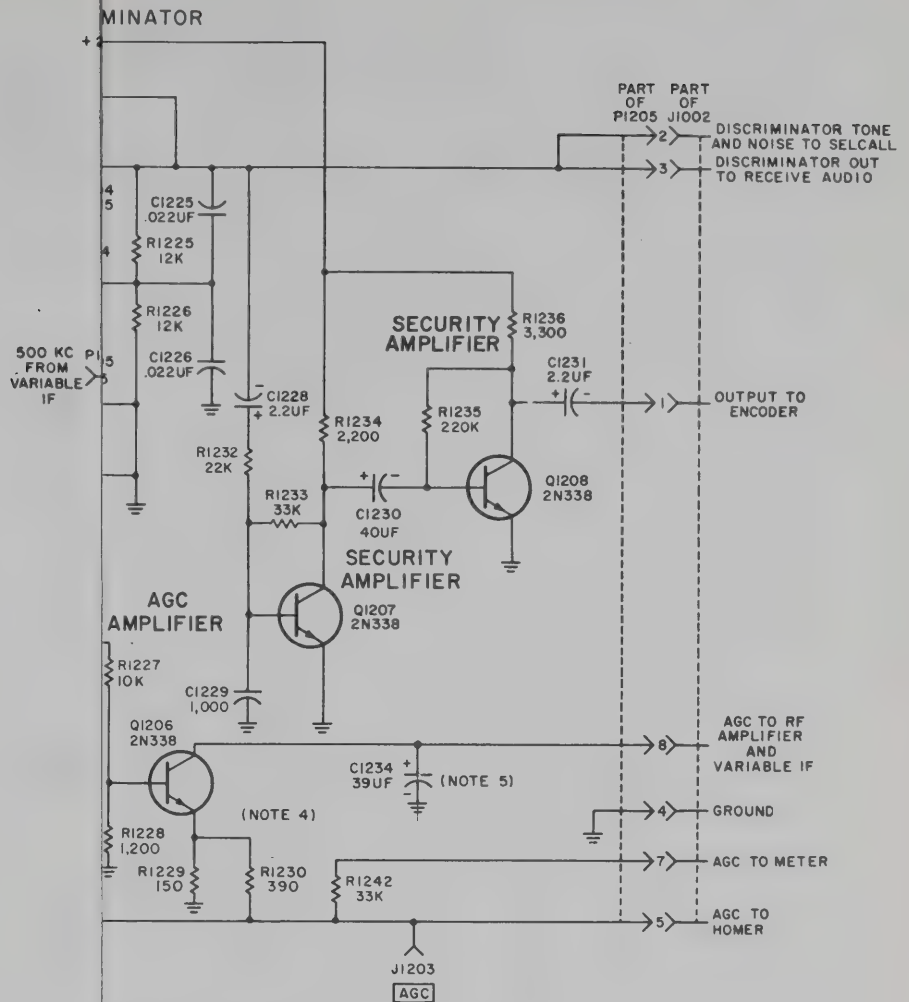


Figure 6-11. Sel-call module, schematic diagram.

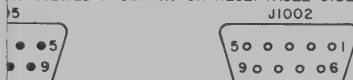
TM5821-244-35-C4-172



OTHERWISE INDICATED:
 STANCE VALUES ARE IN OHMS
 ACITANCE VALUES ARE IN MICROMICROFARADS
 CTANCE VALUES ARE IN MICROHENRIES

NDICATES EQUIPMENT MARKING

OR VIEWED FROM PIN OR RECEPTACLE SIDE.



WITH SERIAL NUMBERS BELOW 1160 THE

IG VALUES APPLY:

I214, AND C1223 ARE 10UF.

S 8,200Ω

S 2,200Ω

S 560Ω

S 220Ω

WITH SERIAL NUMBERS BELOW 1160

R C1234 IS NOT USED.

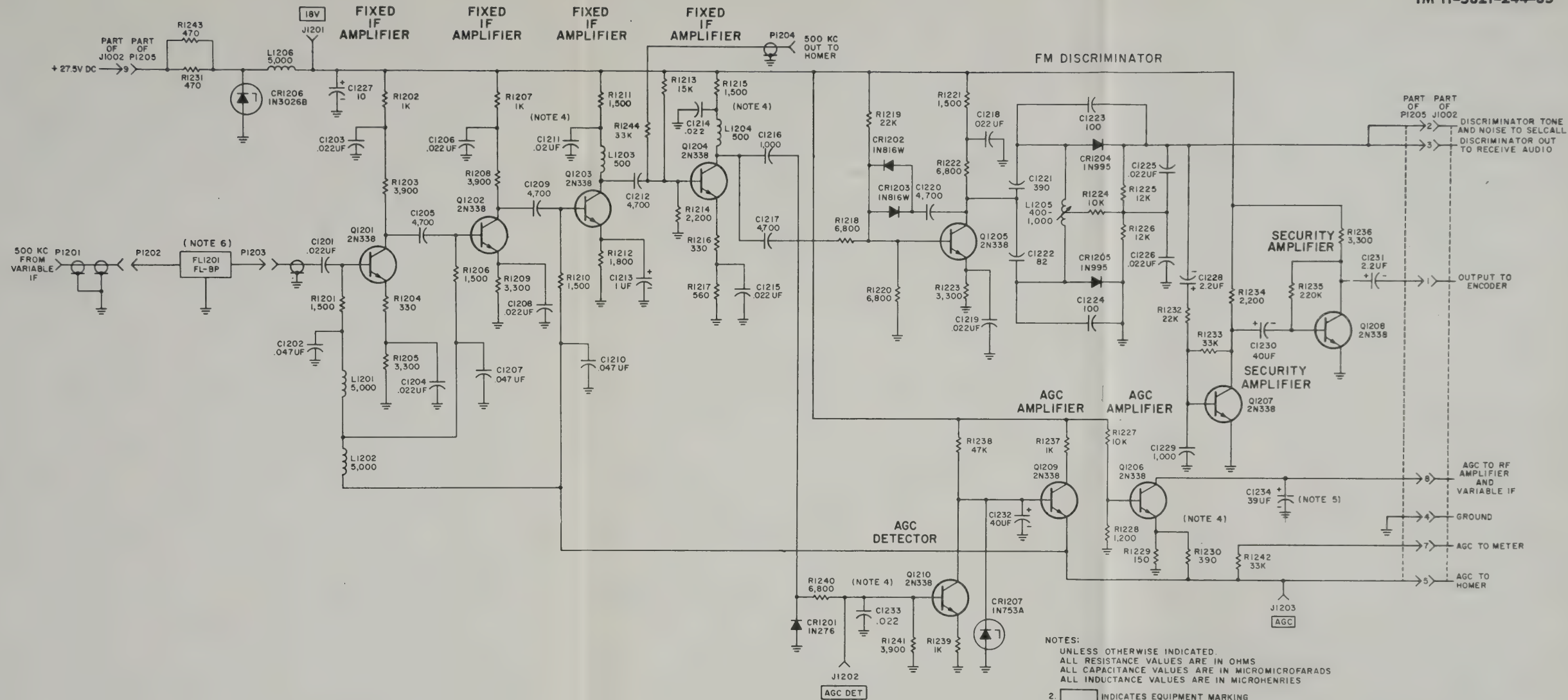
ICRODOT FILTER IS REPLACED WITH A

ICRODOT FILTER IN AREAS WHERE

ITY OF COMMUNICATION WITH WIDEBAND

S REQUIRED.

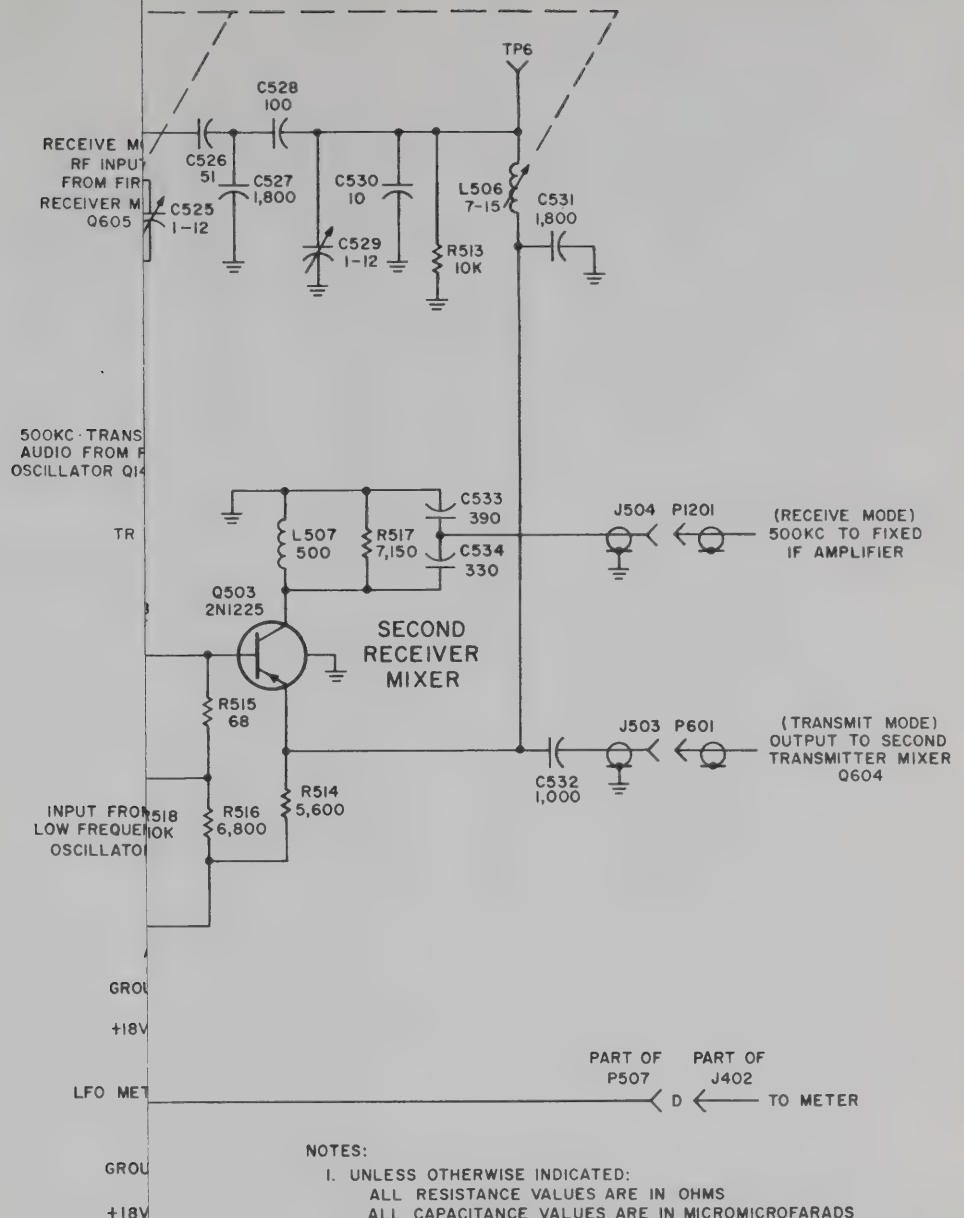
TM5821-244-35-C4-176



- NOTES:
- UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS, ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS, ALL INDUCTANCE VALUES ARE IN MICROHENRIES.
 - INDICATES EQUIPMENT MARKING
 - CONNECTOR VIEWED FROM PIN OR RECEPTACLE SIDE.

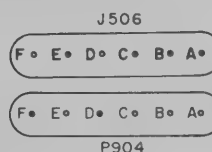
PI205	J1002
1 2 3 4 5	5 0 0 0 0 1
6 7 8 9	9 0 0 0 0 6
 - ON SETS WITH SERIAL NUMBERS BELOW 1160 THE FOLLOWING VALUES APPLY:
 C1211, C1214, AND C1223 ARE 10UF.
 R1227 IS 8,200Ω
 R1228 IS 2,200Ω
 R1229 IS 560Ω
 R1230 IS 220Ω
 - ON SETS WITH SERIAL NUMBERS BELOW 1160 CAPACITOR C1234 IS NOT USED
 - 32KC MICRODOT FILTER IS REPLACED WITH A 55KC MICRODOT FILTER IN AREAS WHERE CAPABILITY OF COMMUNICATION WITH WIDEBAND SETS IS REQUIRED.

Figure 6-14. Fixed IF module, schematic diagram.



NOTES:

- UNLESS OTHERWISE INDICATED:
ALL RESISTANCE VALUES ARE IN OHMS
ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
ALL INDUCTANCE VALUES ARE IN MICROHENRIES
- CONNECTOR VIEWED FROM PIN OR RECEPTACLE SIDE



TM5821-244-35-C4-179

Change 4

6-37

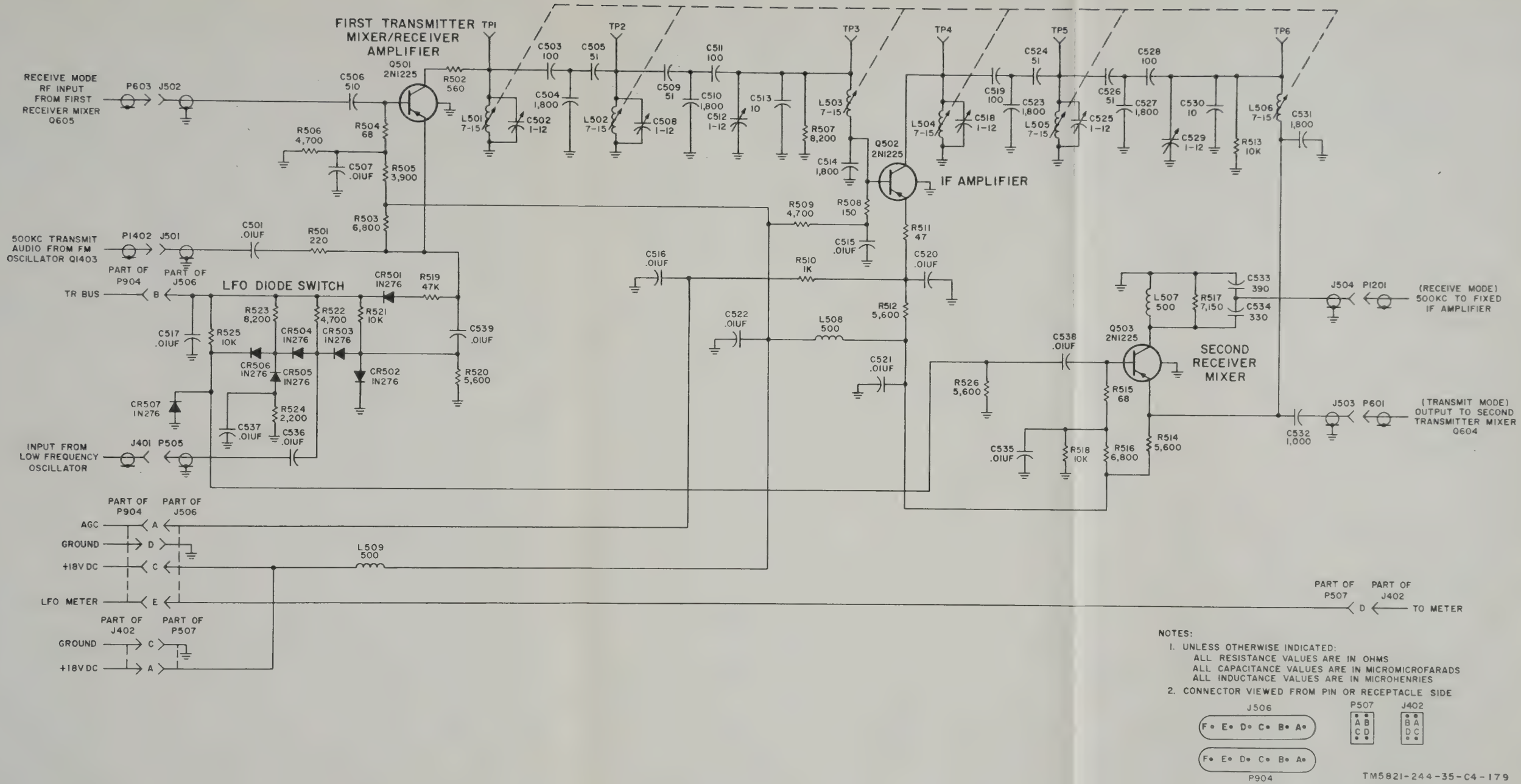
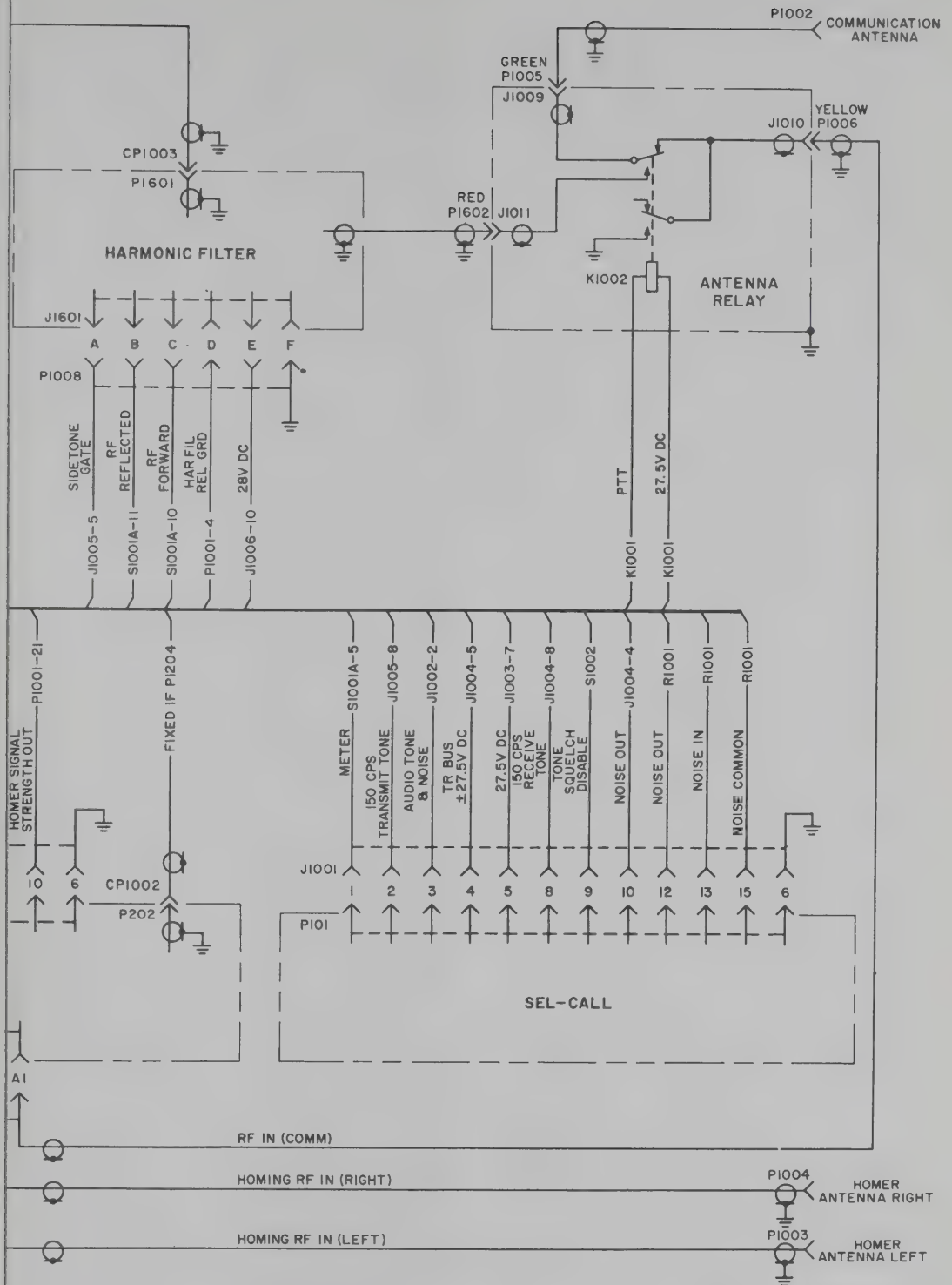
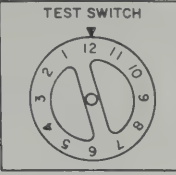
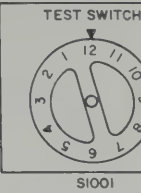


Figure 6-17. Variable IF module, schematic diagram.

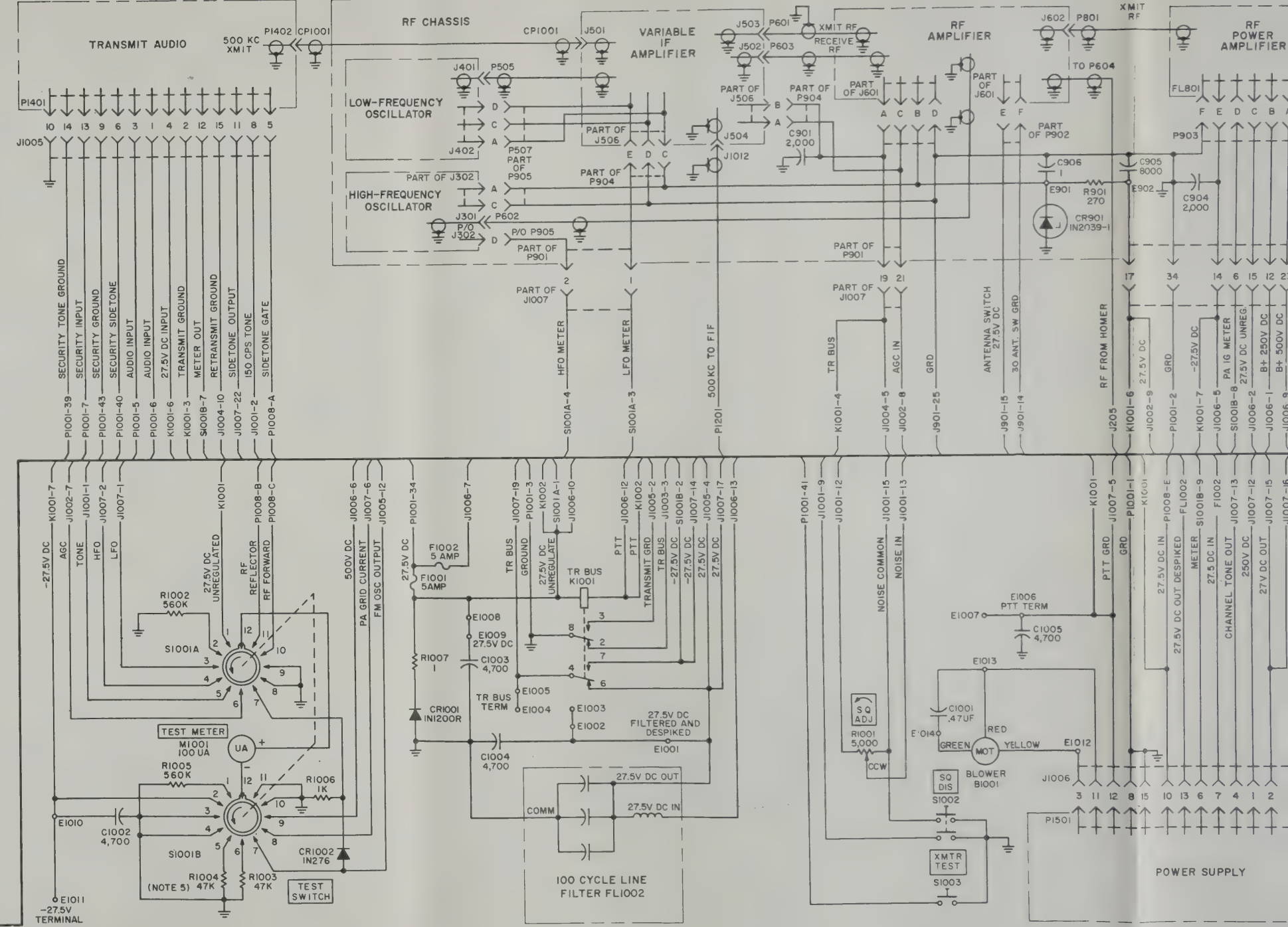
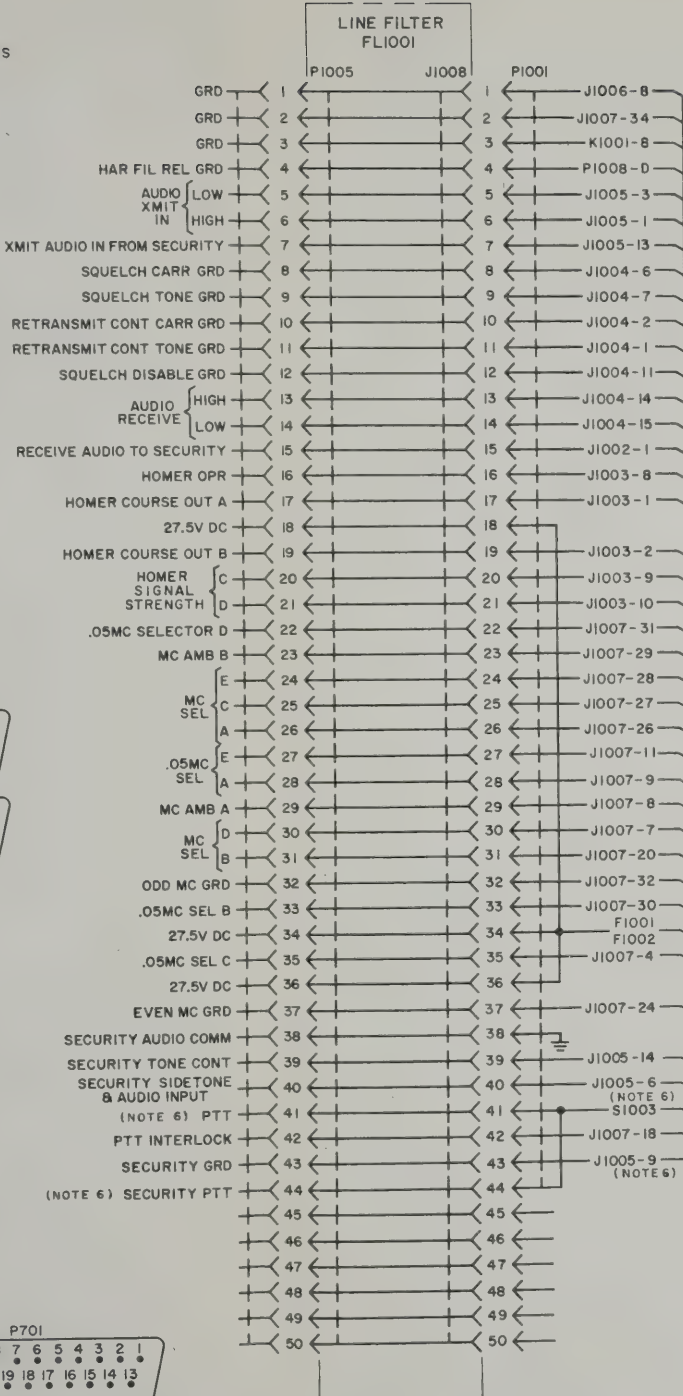
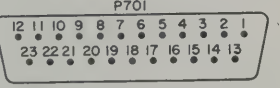
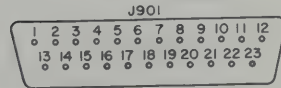
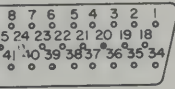
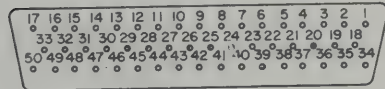
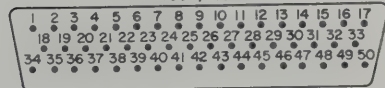
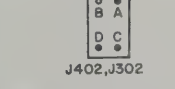
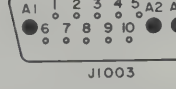
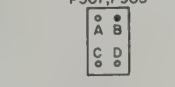
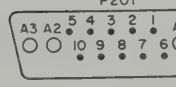
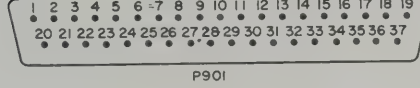
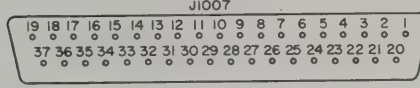
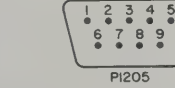
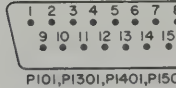
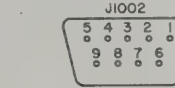
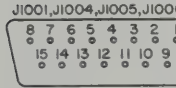
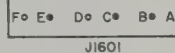
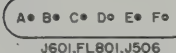
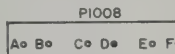
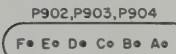


TM5821-244-35-C4-3

- NOTES:
1. UNLESS OTHERWISE INDICATED:
ALL RESISTANCE VALUES ARE IN OHMS
ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
 2.  INDICATES EQUIPMENT MARKING
 3. TEST SWITCH POSITIONS:




4. CONNECTORS VIEWED FROM PIN OR RECEPTACLE SIDE



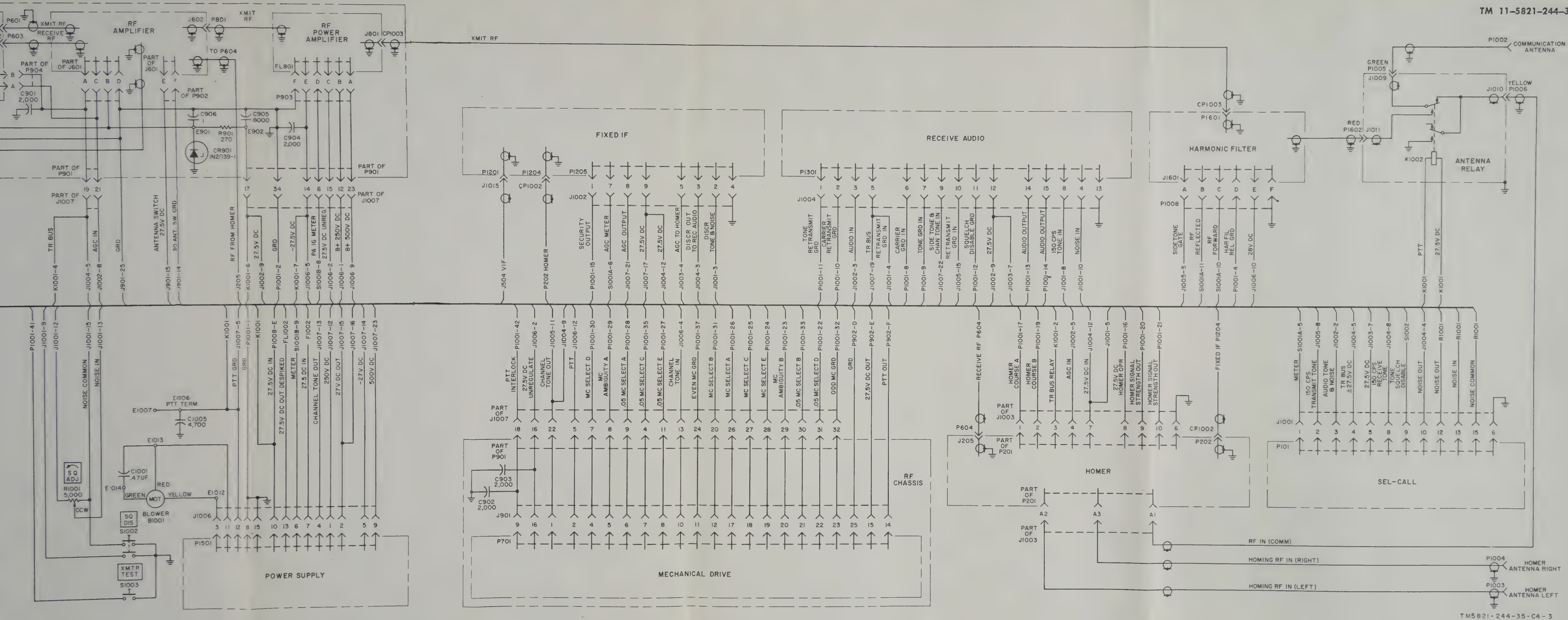


Figure 6-18. Receive-Transmitter, Radio RT-848/ARC-54 wiring diagram.

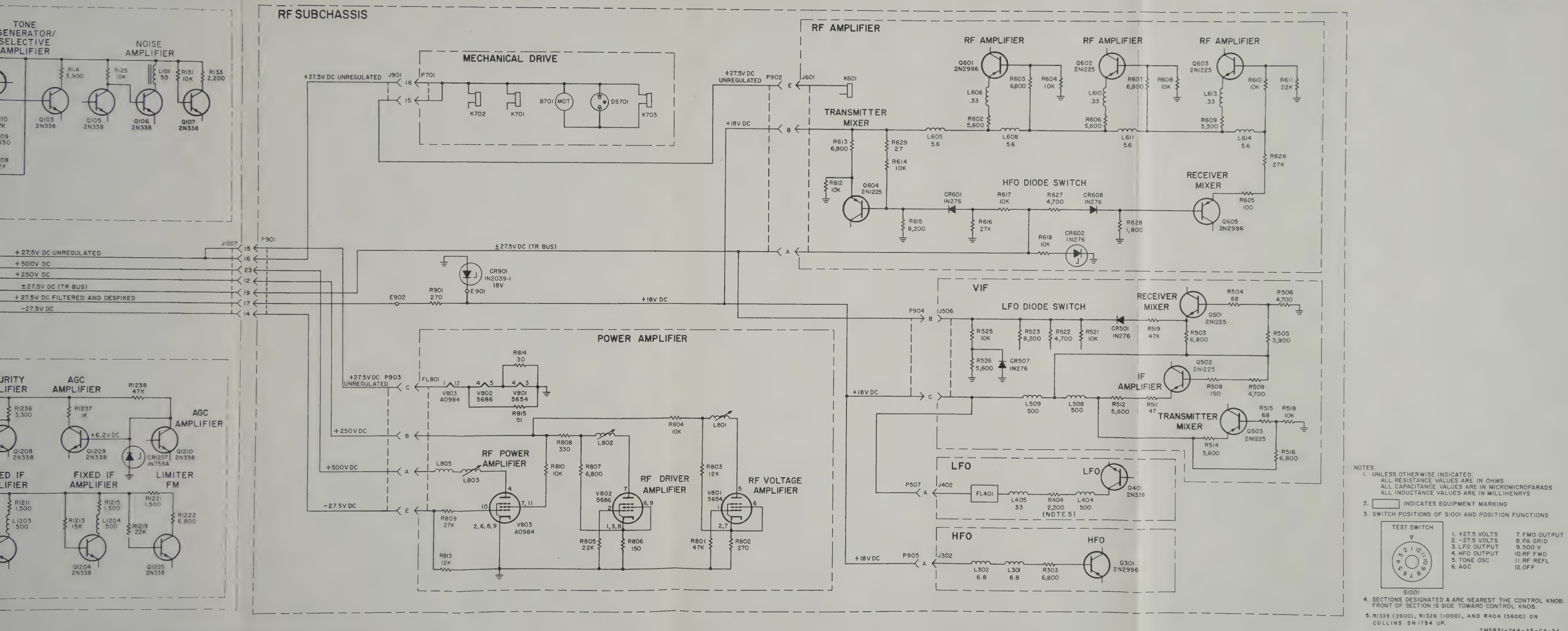
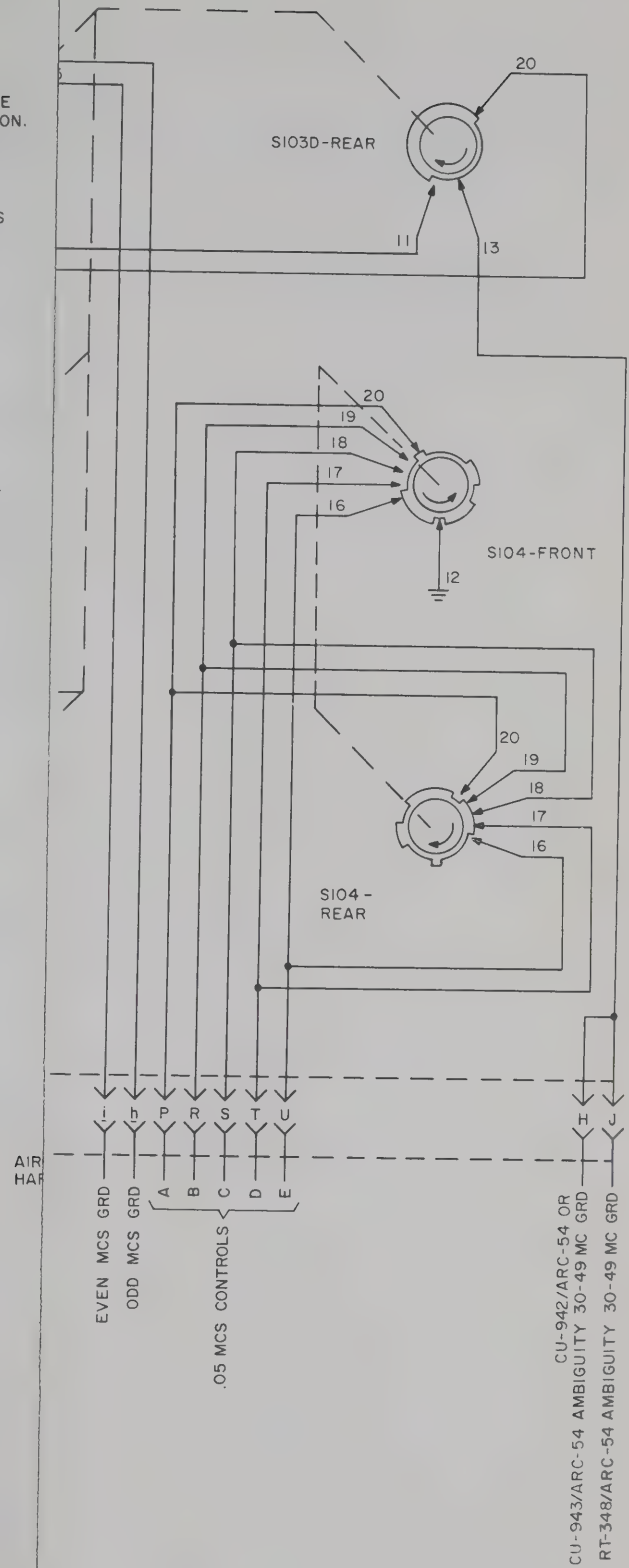
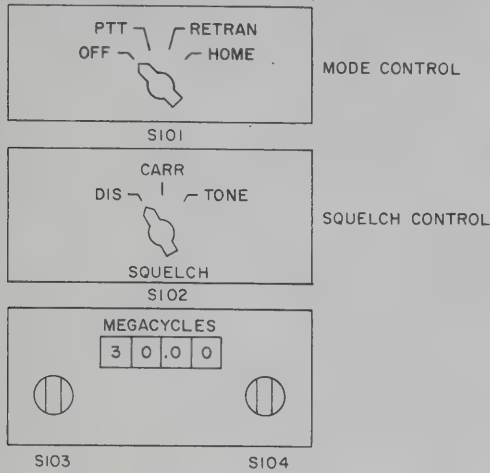


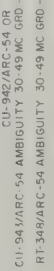
Figure 6-21. Intraunit power distribution and regulation circuits, schematic diagram.

NOTES:

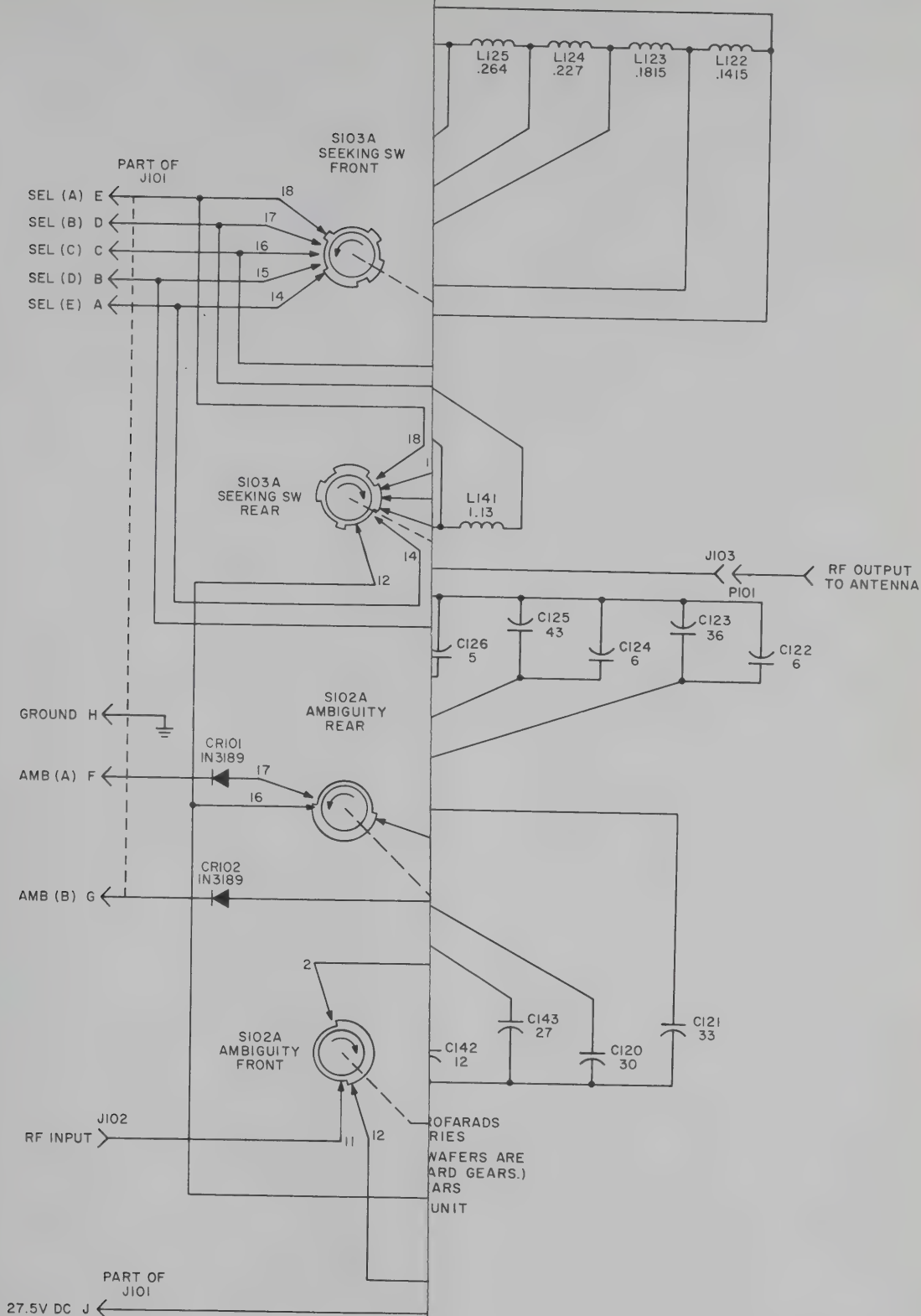
1. UNLESS OTHERWISE INDICATED:
ALL RESISTANCE VALUES ARE IN OHMS
2. S101 AND S102 SHOWN IN EXTREME COUNTERCLOCKWISE POSITION; S103 AND S104 SHOWN IN 30.00 MC POSITION. WAFERS ARE VIEWED FROM SIDE INDICATED (FRONT IS TOWARD KNOB). WAFERS DESIGNATED "A" ARE NEAREST KNOB.
3. S103 AND S104 ROTATE OPPOSITE TO DIRECTION OF KNOB ROTATION AS INDICATED BY ARROWS. (KNOBS ARE GEAR COUPLED TO SWITCH SHAFTS.)
4. SWITCH POSITIONS OF S101, S102, S103 AND S104



- UNLESS OTHERWISE INDICATED:
ALL RESISTANCE VALUES ARE IN OHMS
2. S101 AND S102 SHOWN IN EXTREME COUNTERCLOCKWISE POSITION; S103 AND S104 SHOWN IN 30.00 MC POSITION. WAFERS ARE VIEWED FROM SIDE INDICATED (FRONT IS TOWARD KNOB). WAFERS DESIGNATED "A" ARE NEAREST KNOB.
3. S103 AND S104 ROTATE OPPOSITE TO DIRECTION OF KNOB ROTATION AS INDICATED BY ARROWS. (KNOBS ARE GEAR COUPLED TO SWITCH SHAFTS.)
4. SWITCH POSITIONS OF S101, S102, S103 AND S104



Change 4 6-45



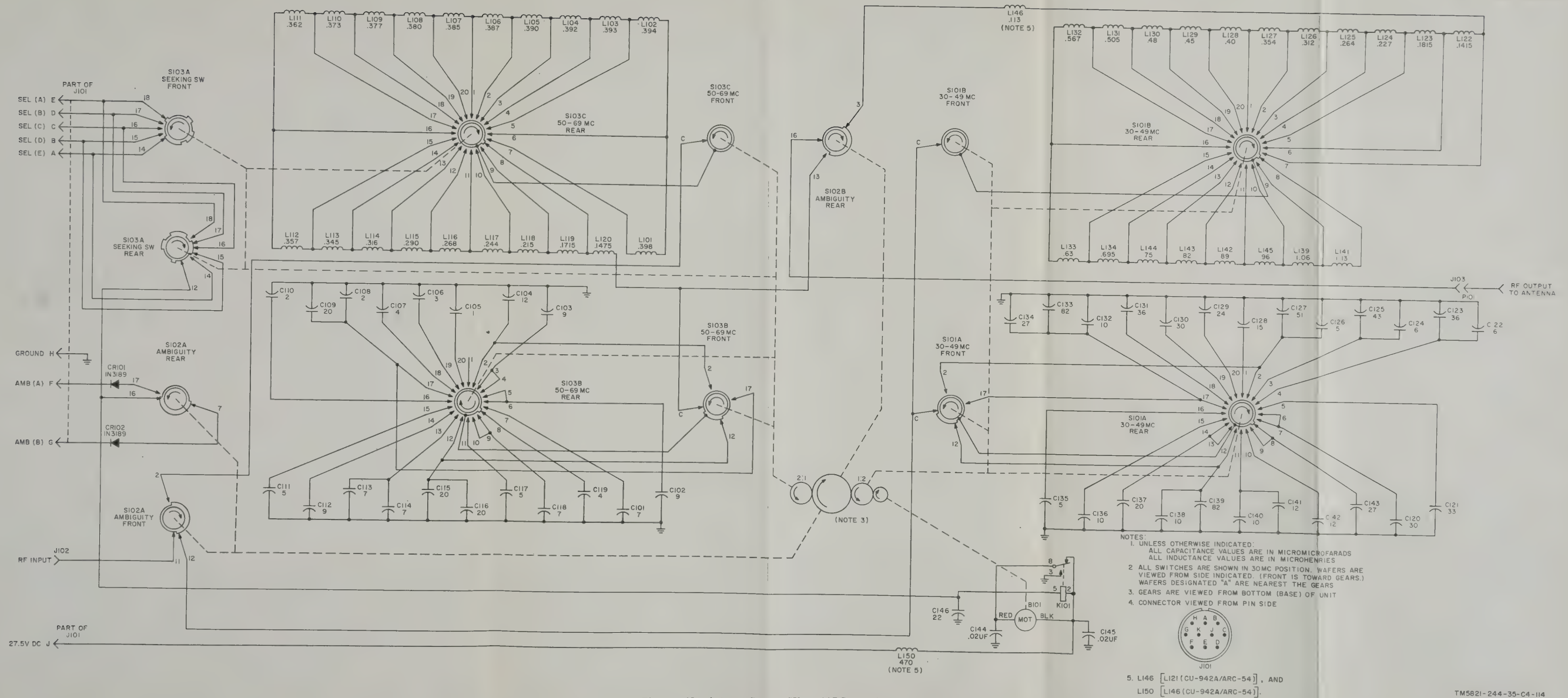
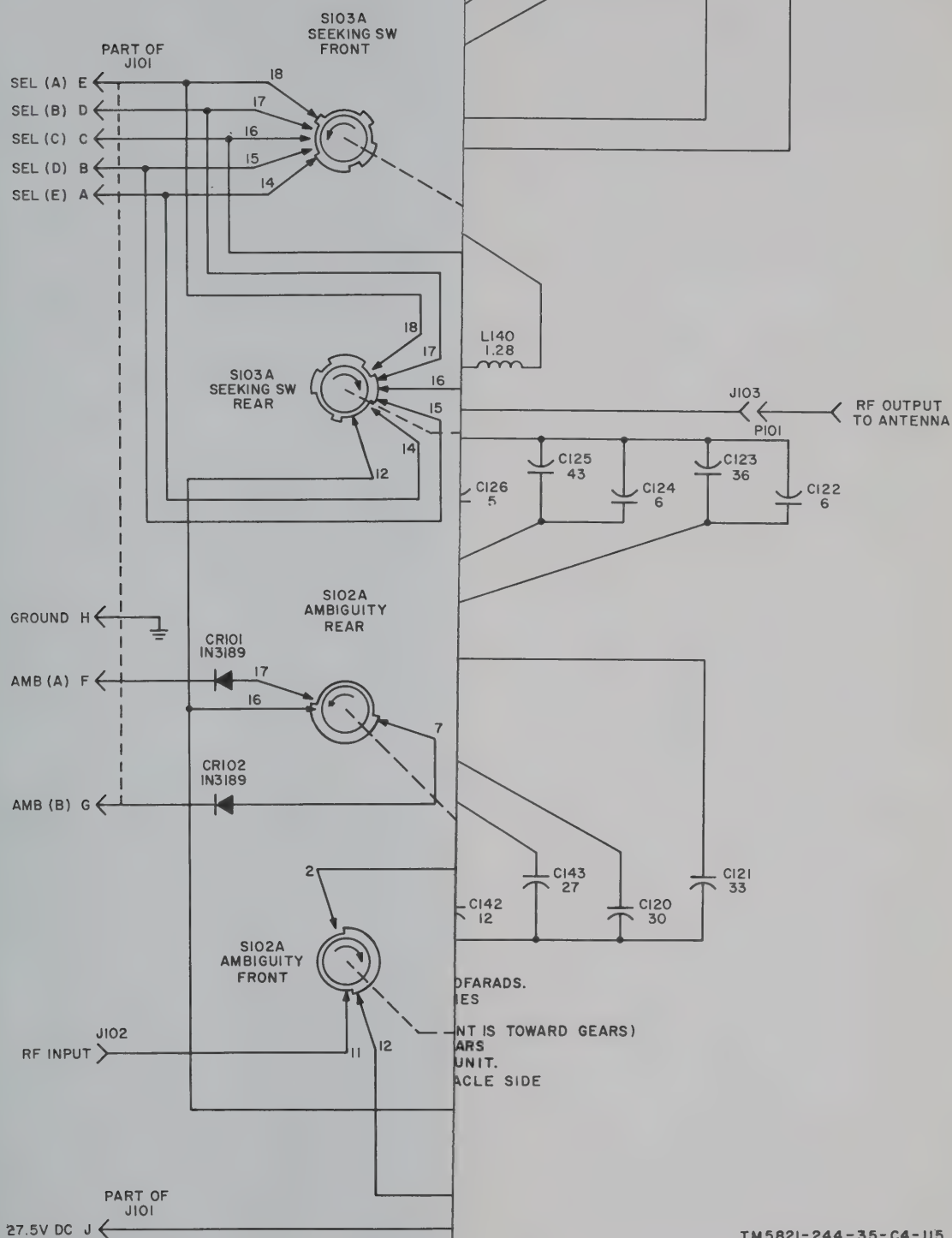


Figure 6-25. Antenna Coupler CU-942/ARC-54, schematic diagram.



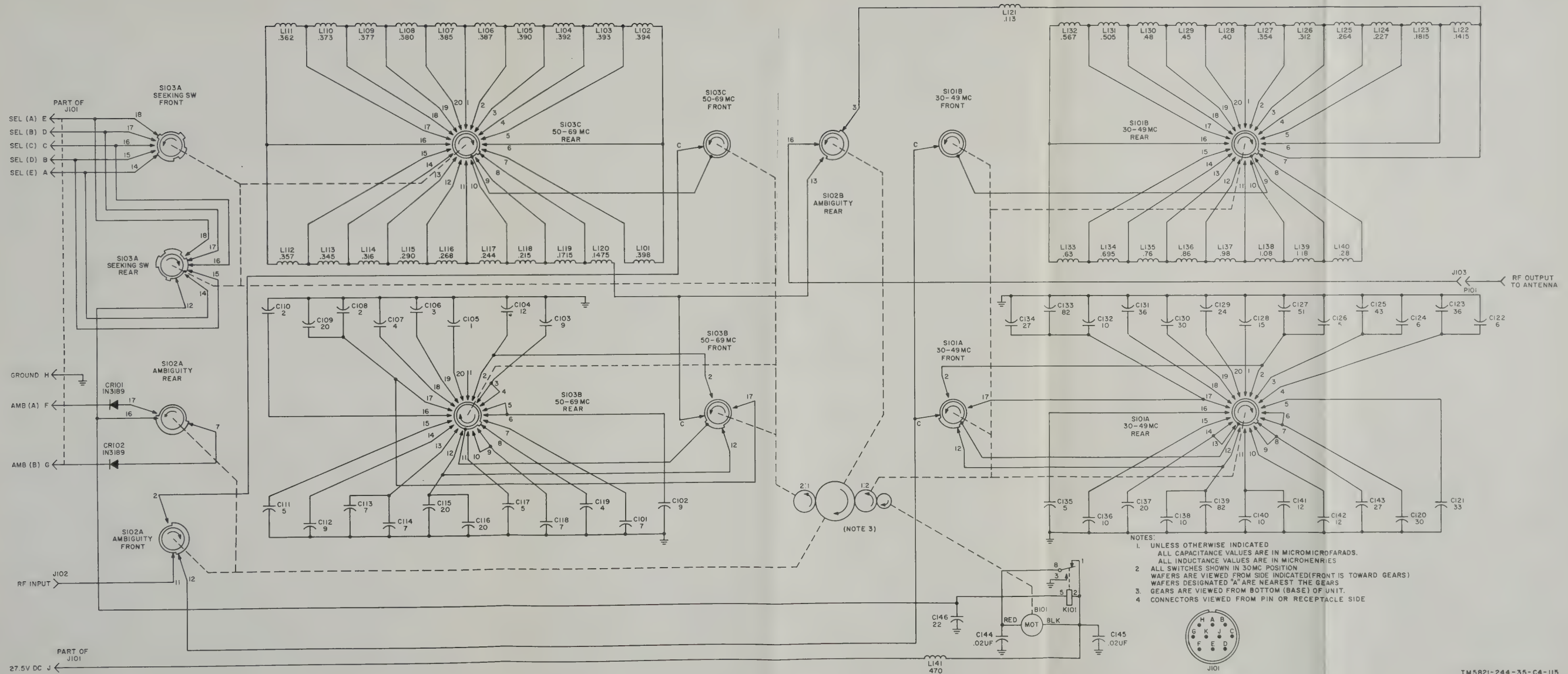
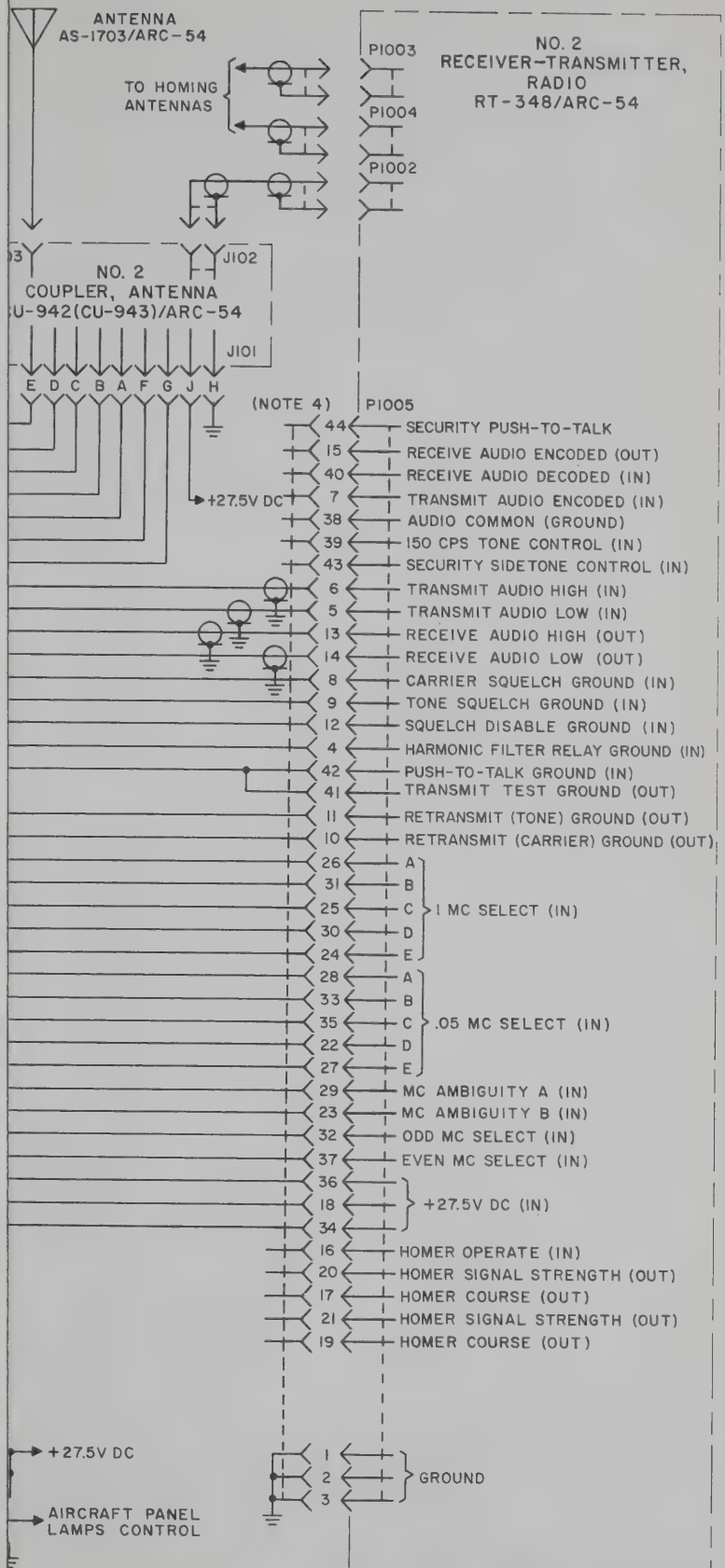


Figure 6-26. Antenna Coupler CU-943/ARC-54, schematic diagram.



TM5821-244-35-C4-61

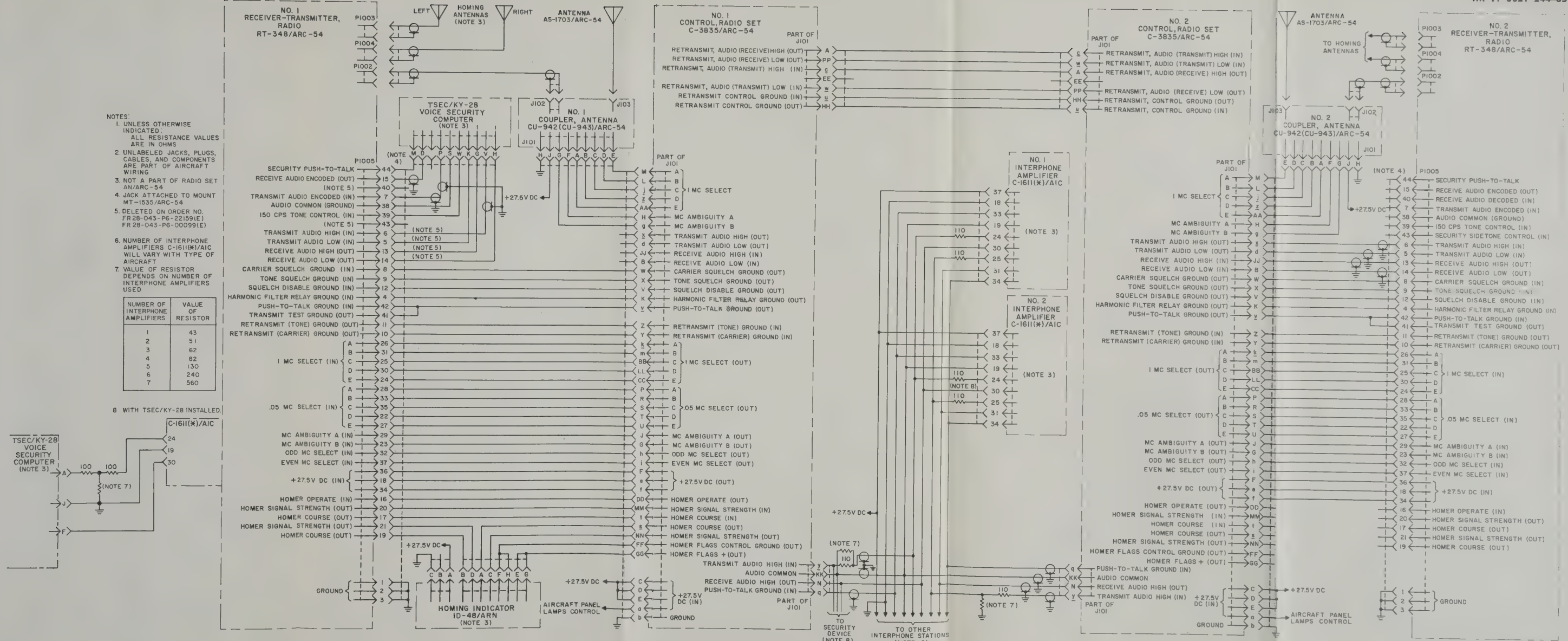


Figure 6-27. Radio Set AN/ARC-54, retransmit system interconnection wiring diagram.



T

A



T

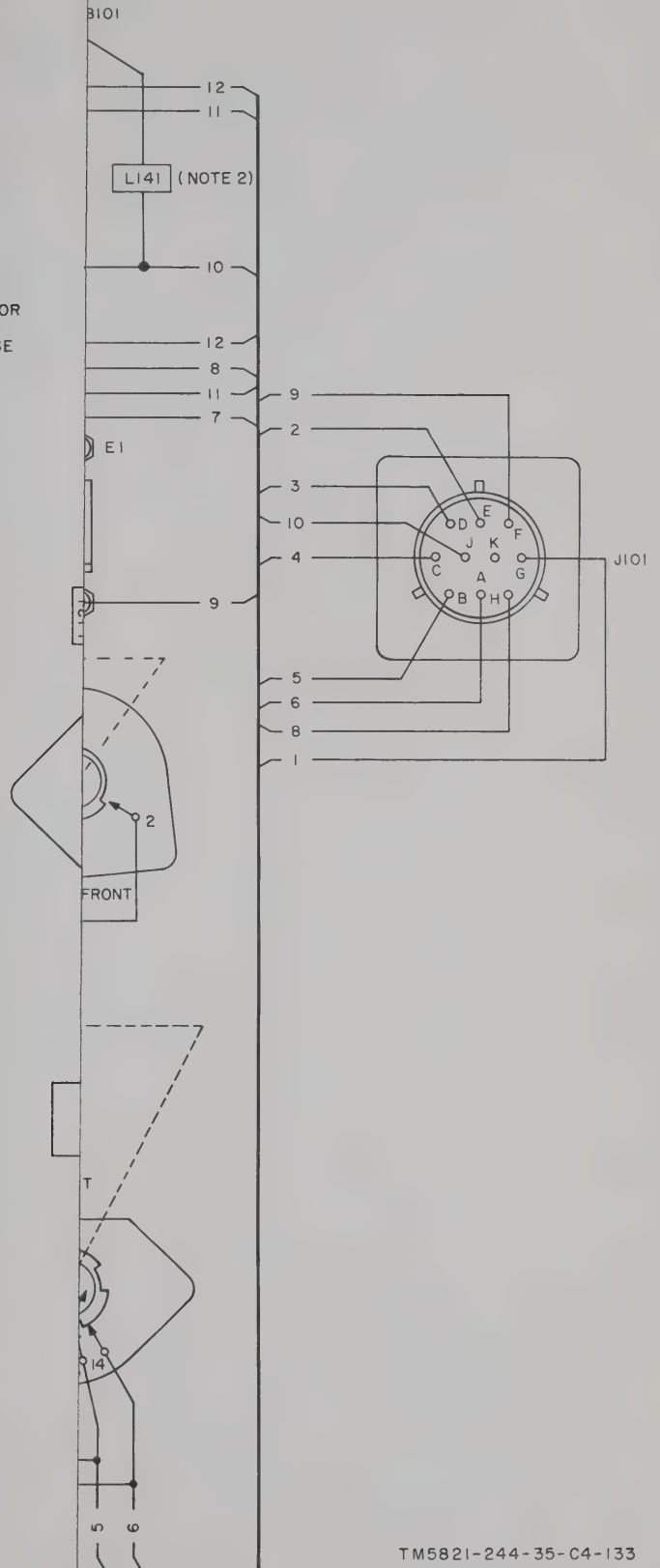


NOTES:

1. INDUCTOR REFERENCE DESIGNATIONS SHOWN ARE FOR CU-943/ARC-54. ALL INDUCTOR REFERENCE DESIGNATIONS REMAIN THE SAME FOR THE CU-942/ARC-54 EXCEPT THOSE SHOWN BELOW

CU-943/ARC-54	CU-942/ARC-54
L135	L144
L136	L143
L137	L142
L138	L145
L140	L141
L121(CU-942A/ ARC-54)	L146

2. L146 (CU-942A/ARC-54)
L150 (CU-942/ARC-54)
L141 (CU-943/ARC-54)



42(A)/ARC-54,

TM5821-244-35-C4-133

Change 4 6-57



NOTES:
1. INDUCTOR REFERENCE DESIGNATIONS SHOWN ARE FOR CU-943/ARC-54 ALL INDUCTOR REFERENCE DESIGNATIONS REMAIN THE SAME FOR THE CU-942/ARC-54 EXCEPT THOSE SHOWN BELOW

CU-943/ARC-54	CU-942/ARC-54
L135	L144
L136	L143
L137	L142
L138	L145
L140	L141
L121 (CU-942A/ARC-54)	L146

2. L146 (CU-942A/ARC-54)
L150 (CU-942/ARC-54)
L141 (CU-943/ARC-54)

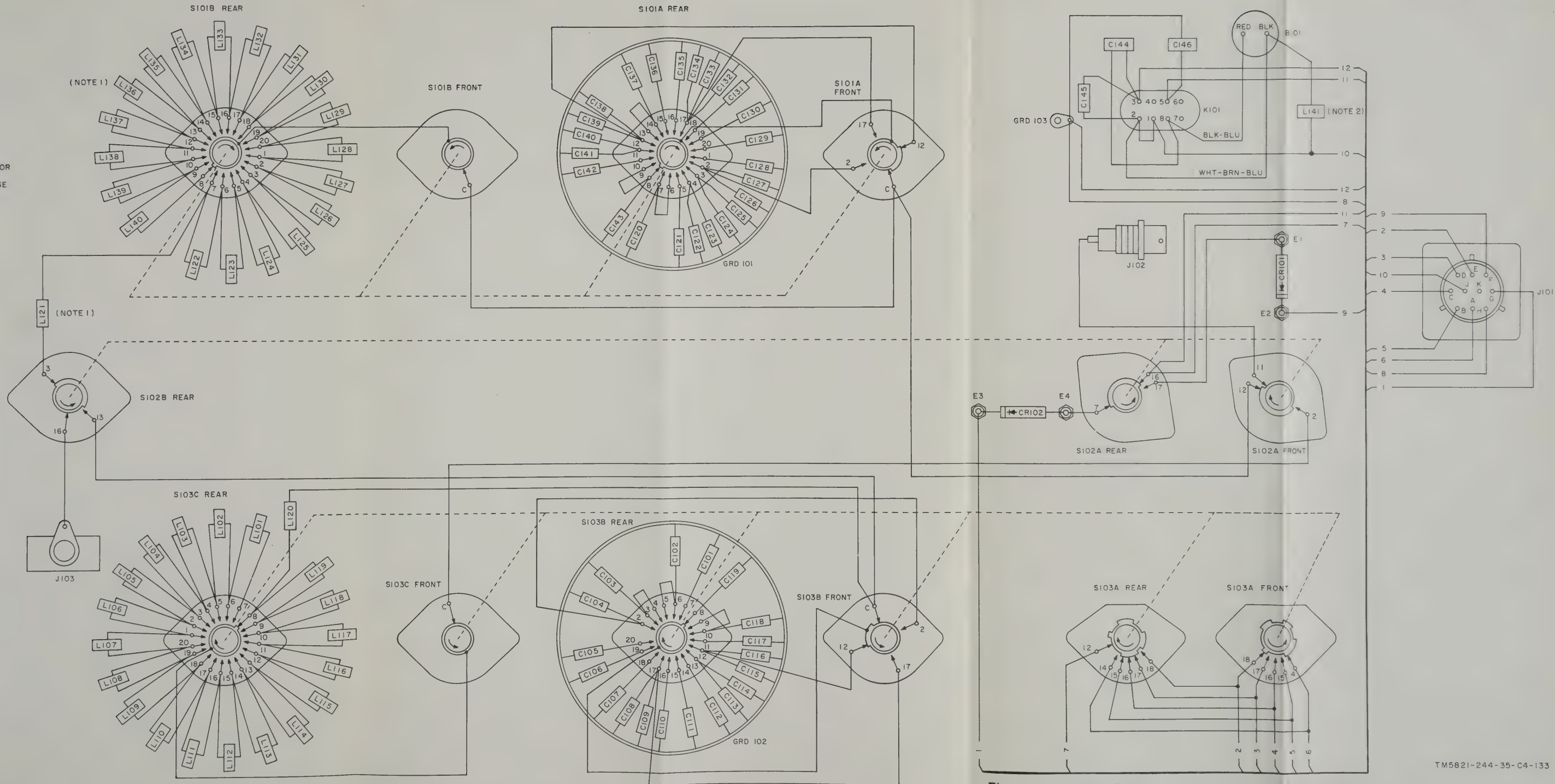
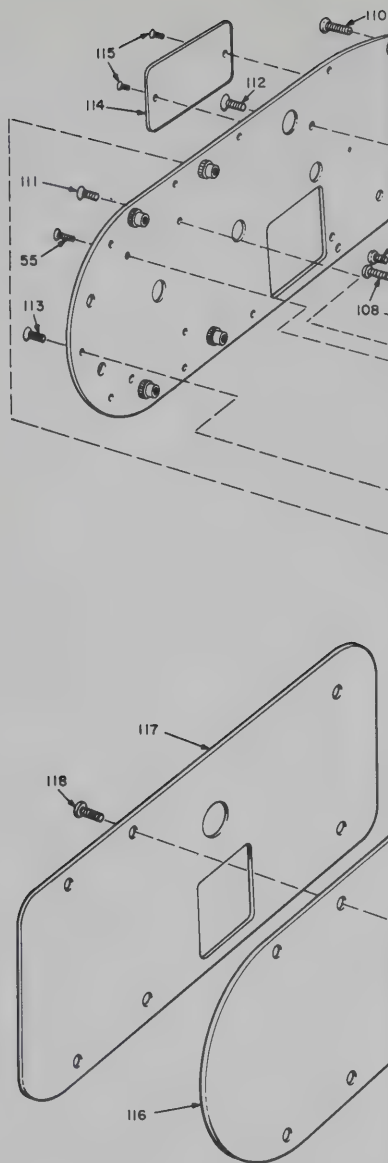
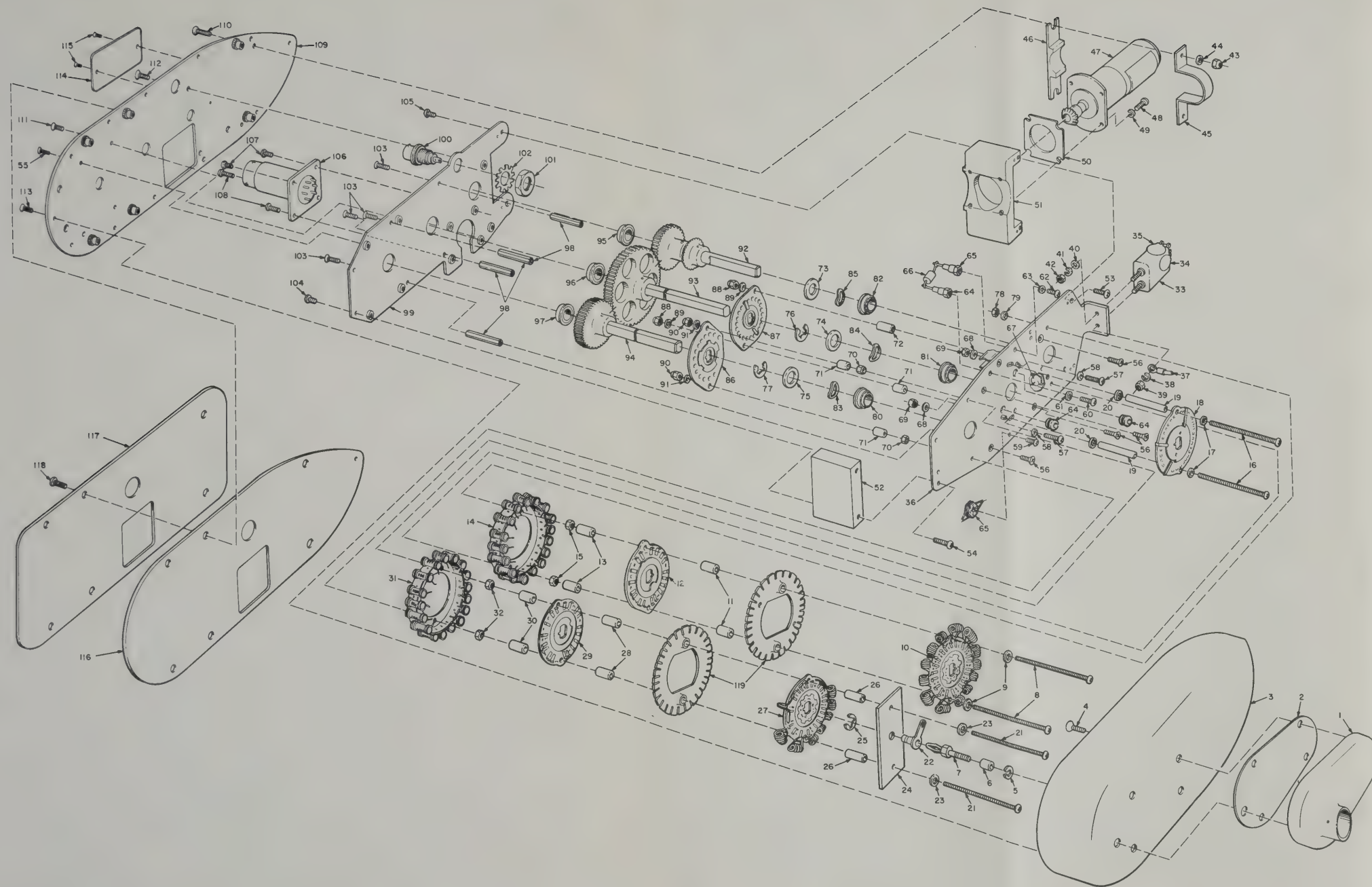


Figure 6-28. Antenna Couplers CU-942/ARC-54, CU-942(A)/ARC-54, and CU-943/ARC-54, wiring diagram.



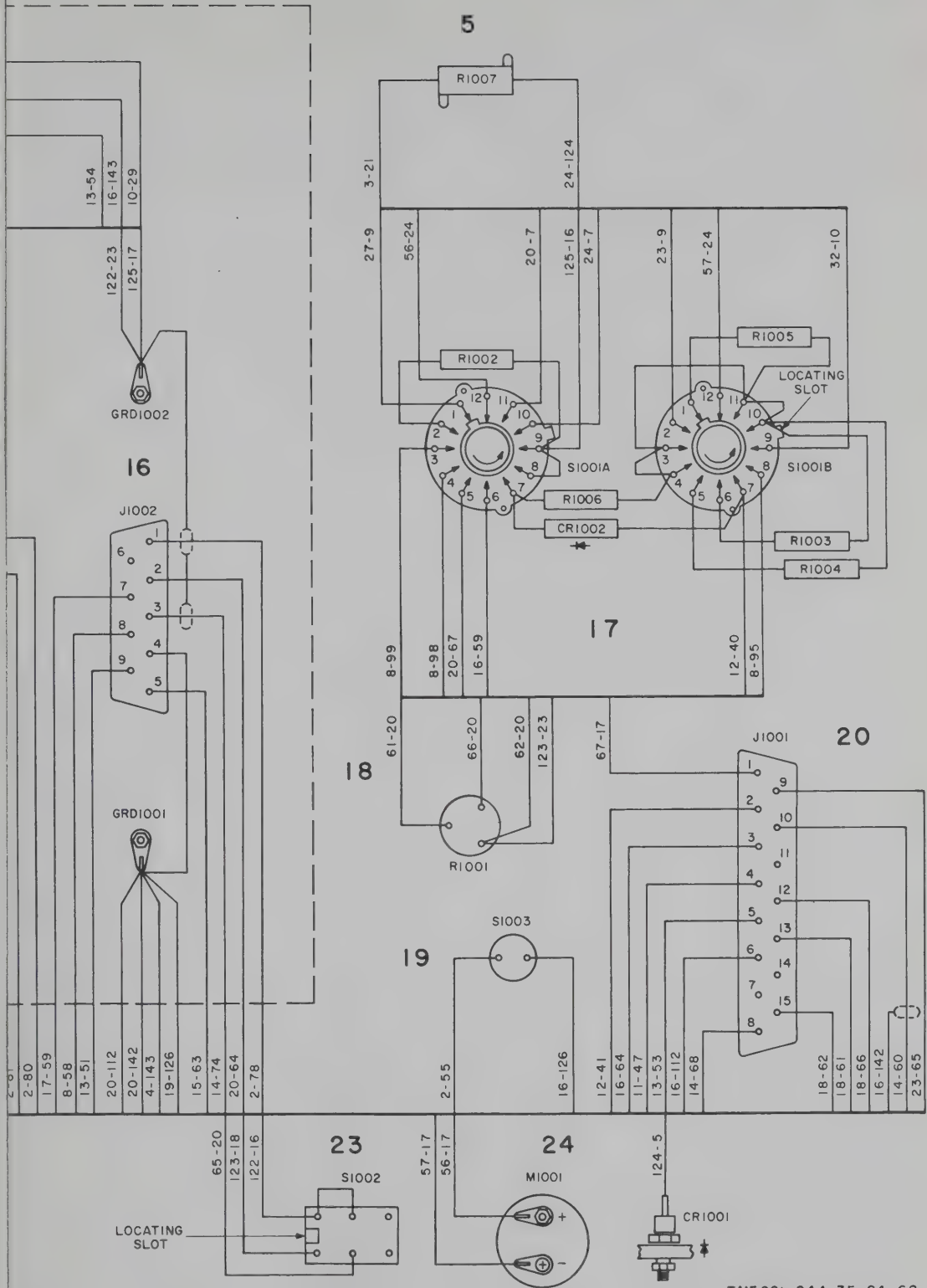
- 59 Screw H2, PPH, 4-40 x $\frac{5}{16}$ -inch
- 60 Screw H44, PPH, 2-56 x $\frac{3}{16}$ -inch
- 61 Lockwasher, No. 2
- 62 Screw H44, PPH, 2-56 x $\frac{3}{16}$ -inch
- 63 Lockwasher, No. 2
- 64 Grommet H15, rubber
- 65 Cable button H8
- 66 Diode CR102, 1N3189
- 67 Diode CR101, 1N3189
- 68 Flat washer H46
- 69 Nut H23, self-locking, 5-40
- 70 Hexagonal nut H45
- 71 Spacer, No. 2, MP20
- 72 Spacer, No. 3, MP18
- 73 Flat washer H16
- 74 Flat washer H16
- 75 Flat washer H16
- 76 Retainer ring H9
- 77 Retainer ring H9
- 78 Nut H23, self-locking, 5-40
- 79 Flat washer H46
- 80 Ball bearing MP8
- 81 Ball bearing MP8
- 82 Ball bearing MP8
- 83 Spring washer H26
- 84 Spring washer H26
- 85 Spring washer H26
- 86 Rotary switch S103A
- 87 Rotary switch S102A
- 88 Nut H23, self-locking, 5-40
- 89 Flat washer H46
- 90 Nut H23, self-locking, 5-40
- 91 Flat washer H46
- 92 Shaft assembly No. 1 MP15
- 93 Shaft assembly No. 2 MP12
- 94 Shaft assembly No. 3 MP10
- 95 Ball bearing MP8
- 96 Ball bearing MP8
- 97 Ball bearing MP8
- 98 Hexagonal post H48
- 99 Lower bearing plate MP3
- 100 Rf connector J101
- 101 Part of item 100 (hexagonal nut)
- 102 Part of item 100 (external-tooth lockwasher)
- 103 Screw H49, PPH, 4-40 x $\frac{1}{4}$ -inch
- 104 Screw H2, PPH, 4-40 x $\frac{5}{16}$ -inch
- 105 Screw H2, PPH, 4-40 x $\frac{5}{16}$ -inch
- 106 Electrical connector J101 (includes interference filter)
- 107 Screw H17, PPH, 4-40 x $\frac{3}{16}$ -inch
- 108 Screw H25, PPH, 4-40 x $\frac{1}{4}$ -inch
- 109 Mounting plate MP22 (RIVETED TO 99 IN LATE MODELS)
- 110 Screw H39, PPH, 4-40 x $\frac{7}{16}$ -inch
- 111 Screw H37, PPH, 4-40 x $\frac{3}{16}$ -inch
- 112 Screw H37, PPH, 4-40 x $\frac{3}{16}$ -inch
- 113 Screw H52, PPH, 4-40 x $\frac{1}{4}$ -inch
- 114 Nameplate MP35
- 115 Screw H33, PPH, 2-56 x $\frac{1}{8}$ -inch
- 116 Gasket R28
- 117 Doubler plate MP24
- 118 Screw H32, PPH, 8-32 x $\frac{1}{2}$ -inch
- 119 Coil-mounting plate MP30

CU-54 and CU-943/ARC-54, exploded view.



- 1 Mast plate MP27
- 2 Mast gasket H35
- 3 Antenna cover MP25
- 4 Screw H34, PFH 6-32 x 7/16-inch
- 5 Lockwasher H50
- 6 Spacing sleeve MP35
- 7 Plug tip P1
- 8 Screw H51, PPH, 5-40 x 1 1/8 inches
- 9 Washer H47, nonmetallic No. 5
- 10 Rotary switch assembly S101B (includes coils and mounting plate MP30)
- 11 Spacer, No. 2 MP20
- 12 Rotary switch S101A
- 13 Spacer, No. 1 MP19
- 14 Grounding ring H14 (capacitors shown attached to ground ring)
- 15 Hexagonal nut H45, 5-40
- 16 Screw H19, PPH, 5-40 x 1 1/2 inches
- 17 Washer H47, nonmetallic No. 5
- 18 Rotary switch S102B
- 19 Spacer, No. 4 MP21
- 20 Flat washer H46
- 21 Screw H20, PPH, 5-40 x 2 inches
- 22 Connector J103
- 23 Flat washer H46
- 24 Bracket H12, jack tip
- 25 Retaining ring H43
- 26 Spacer, No. 3 MP18
- 27 Rotary switch assembly S103C (includes coils and mounting plate MP30)
- 28 Spacer, No. 2 MP20
- 29 Rotary switch S103B
- 30 Spacer, No. 1 MP19
- 31 Grounding ring H14 (capacitors shown attached to ground ring)
- 32 Hexagonal nut H45, 5-40
- 33 Relay K101
- 34 Capacitor C144, 0.02 μ f
- 35 Capacitor C145, 0.02 μ f
- 36 Upper bearing plate MP5
- 37 Solderless terminal
- 38 Lockwasher, No. 4 H21
- 39 Hexagonal nut H24, 4-40
- 40 Flat washer, No. 4 H22
- 41 Lockwasher, No. 4 H21
- 42 Hexagonal nut H24, 4-40
- 43 Nut H41, self-locking 4-40
- 44 Flat washer H40, No. 4
- 45 Motor clamp H38
- 46 Motor spacer MP29
- 47 Motor assembly B101
- 48 Screw H2, PPH, 4-40 x 5/16-inch
- 49 Lockwasher, No. 4 H21
- 50 Shim MP31, MP32, MP33, or MP34
- 51 Rear spacer MP7
- 52 Front spacer MP6
- 53 Screw H2, PPH, 4-40 x 5/16-inch
- 54 Screw H2, PPH, 4-40 x 5/16-inch
- 55 Screw H37, PFH, 4-40 x 5/16-inch
- 56 Screw H49, PFH, 4-40 x 1/4-inch
- 57 Screw H42, PPH, 5-40 x 7/8-inch
- 58 Flat washer H46
- 59 Screw H2, PPH, 4-40 x 5/16-inch
- 60 Screw H44, PPH, 2-56 x 3/16-inch
- 61 Lockwasher, No. 2
- 62 Screw H44, PPH, 2-56 x 3/16-inch
- 63 Lockwasher, No. 2
- 64 Grommet H15, rubber
- 65 Cable button H8
- 66 Diode CR102, 1N3189
- 67 Diode CR101, 1N3189
- 68 Flat washer H46
- 69 Nut H23, self-locking, 5-40
- 70 Hexagonal nut H45
- 71 Spacer, No. 2, MP20
- 72 Spacer, No. 3, MP18
- 73 Flat washer H16
- 74 Flat washer H16
- 75 Flat washer H16
- 76 Retainer ring H9
- 77 Retainer ring H9
- 78 Nut H23, self-locking, 5-40
- 79 Flat washer H46
- 80 Ball bearing MP8
- 81 Ball bearing MP8
- 82 Ball bearing MP8
- 83 Spring washer H26
- 84 Spring washer H26
- 85 Spring washer H26
- 86 Rotary switch S103A
- 87 Rotary switch S102A
- 88 Nut H23, self-locking, 5-40
- 89 Flat washer H46
- 90 Nut H23, self-locking, 5-40
- 91 Flat washer H46
- 92 Shaft assembly No. 1 MP15
- 93 Shaft assembly No. 2 MP12
- 94 Shaft assembly No. 3 MP10
- 95 Ball bearing MP8
- 96 Ball bearing MP8
- 97 Ball bearing MP8
- 98 Hexagonal post H48
- 99 Lower bearing plate MP3
- 100 Rf connector J101
- 101 Part of item 100 (hexagonal nut)
- 102 Part of item 100 (external-tooth lockwasher)
- 103 Screw H49, PFH, 4-40 x 1/4-inch
- 104 Screw H2, PPH, 4-40 x 5/16-inch
- 105 Screw H2, PPH, 4-40 x 5/16-inch
- 106 Electrical connector J101 (includes interference filter)
- 107 Screw H17, PPH, 4-40 x 3/16-inch
- 108 Screw H25, PPH, 4-40 x 1/4-inch
- 109 Mounting plate MP22 (RIVETED TO 99 IN LATE MODELS)
- 110 Screw H39, PPH, 4-40 x 7/16-inch
- 111 Screw H37, PPH, 4-40 x 5/16-inch
- 112 Screw H37, PPH, 4-40 x 5/16-inch
- 113 Screw H52, PPH, 4-40 x 1/4-inch
- 114 Nameplate MP35
- 115 Screw H33, PPH, 2-56 x 1/8-inch
- 116 Gasket R28
- 117 Doubler plate MP24
- 118 Screw H32, PPH, 8-32 x 1/2-inch
- 119 Coil-mounting plate MP30

Figure 6-29. Antenna Couplers CU-942/ARC-54 and CU-943/ARC-54, exploded view.



NOTES:

1. THE NUMBER ON EACH WIRE ADJACENT TO THE COMMON OR BASE LINE CORRESPONDS TO THE LARGE NUMBER ADJACENT TO THE STATION TO WHICH THE WIRE RUNS
2.  DENOTES SHIELDED WIRE
3.  DENOTES COAXIAL CABLE

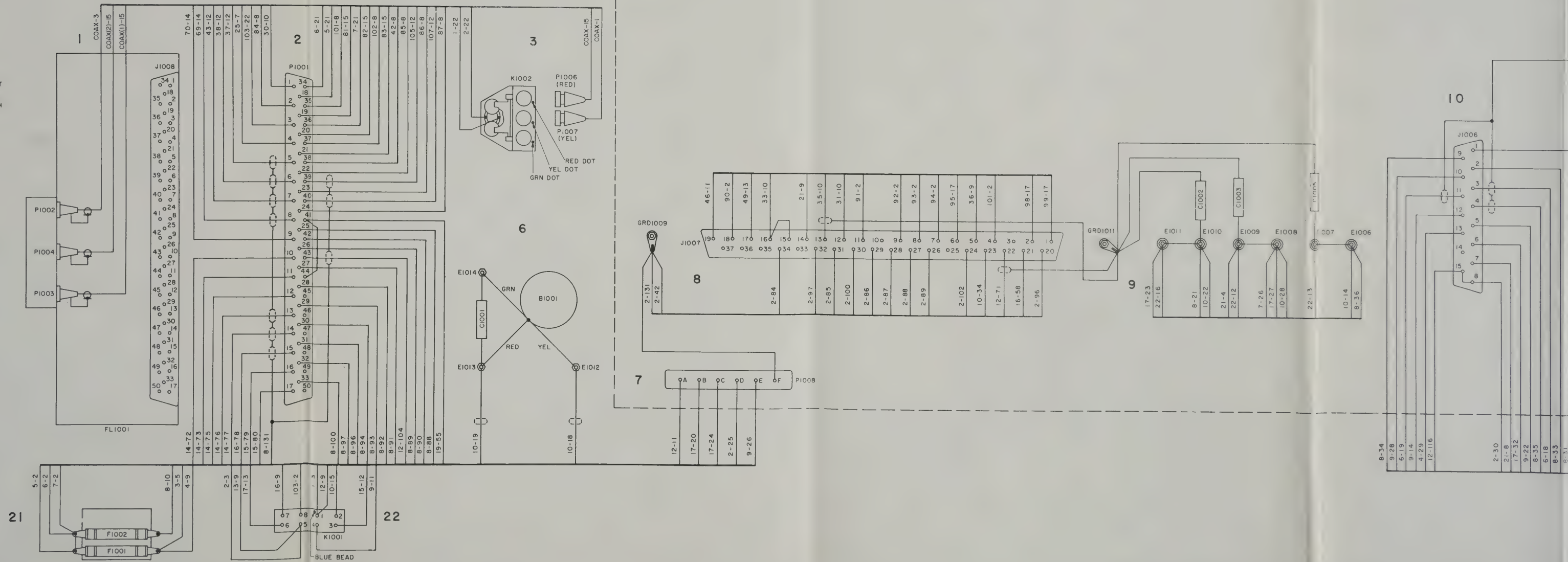


Figure 6-30. Receiver-Transmitter, Radio RT-348/ARC-54, main chassis wiring diagram.

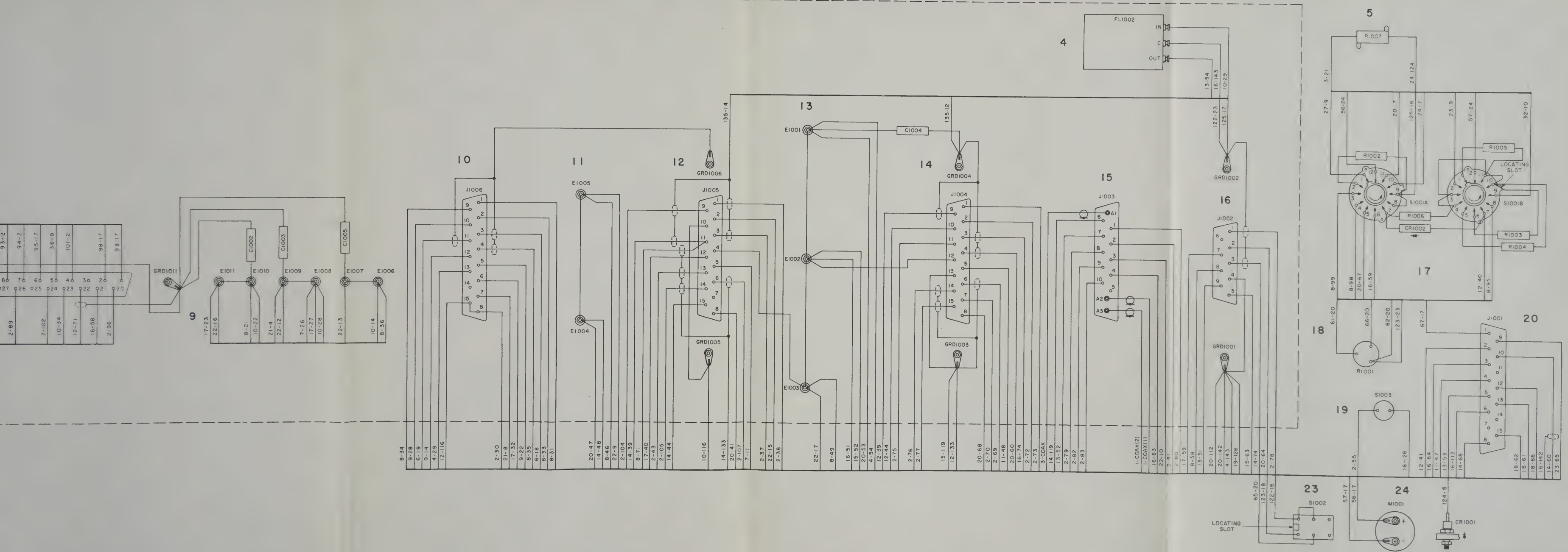
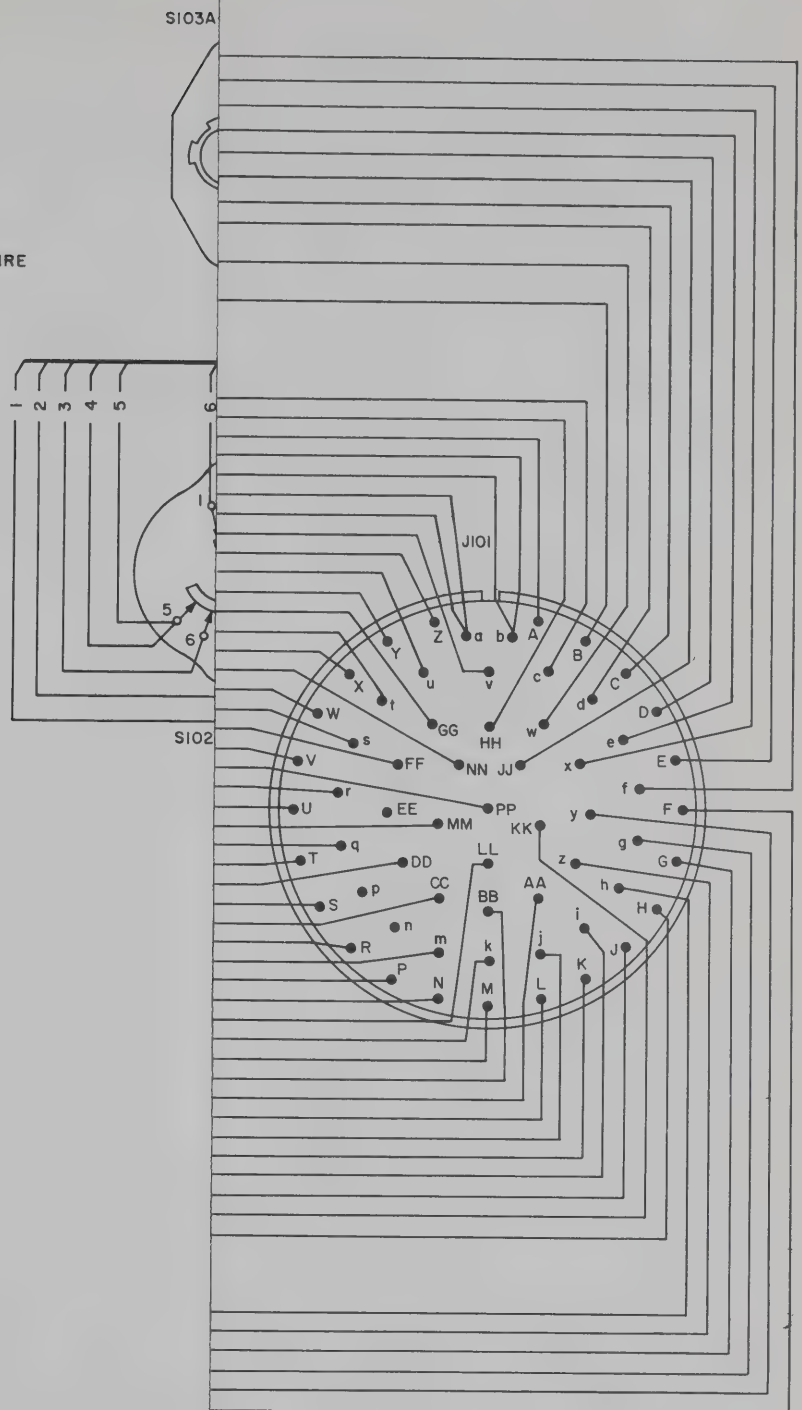


Figure 6-50. Receiver-Transmitter, Radio RT-348/ARC-54, main chassis wiring diagram.

NOTE:

⎓ DENOTES SHIELDED WIRE



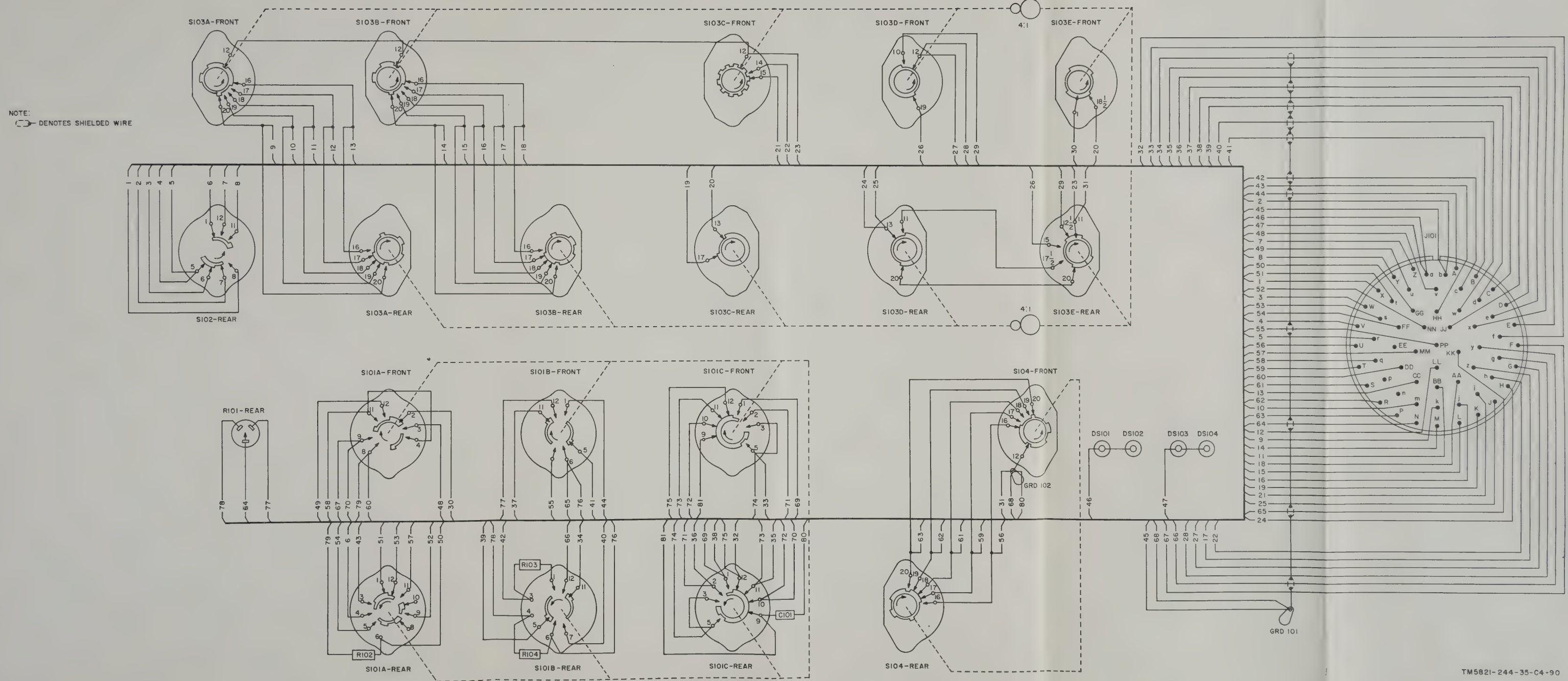


Figure 6-31. Control, Radio Set C-3835/ARC-54, wiring diagram.



1

2

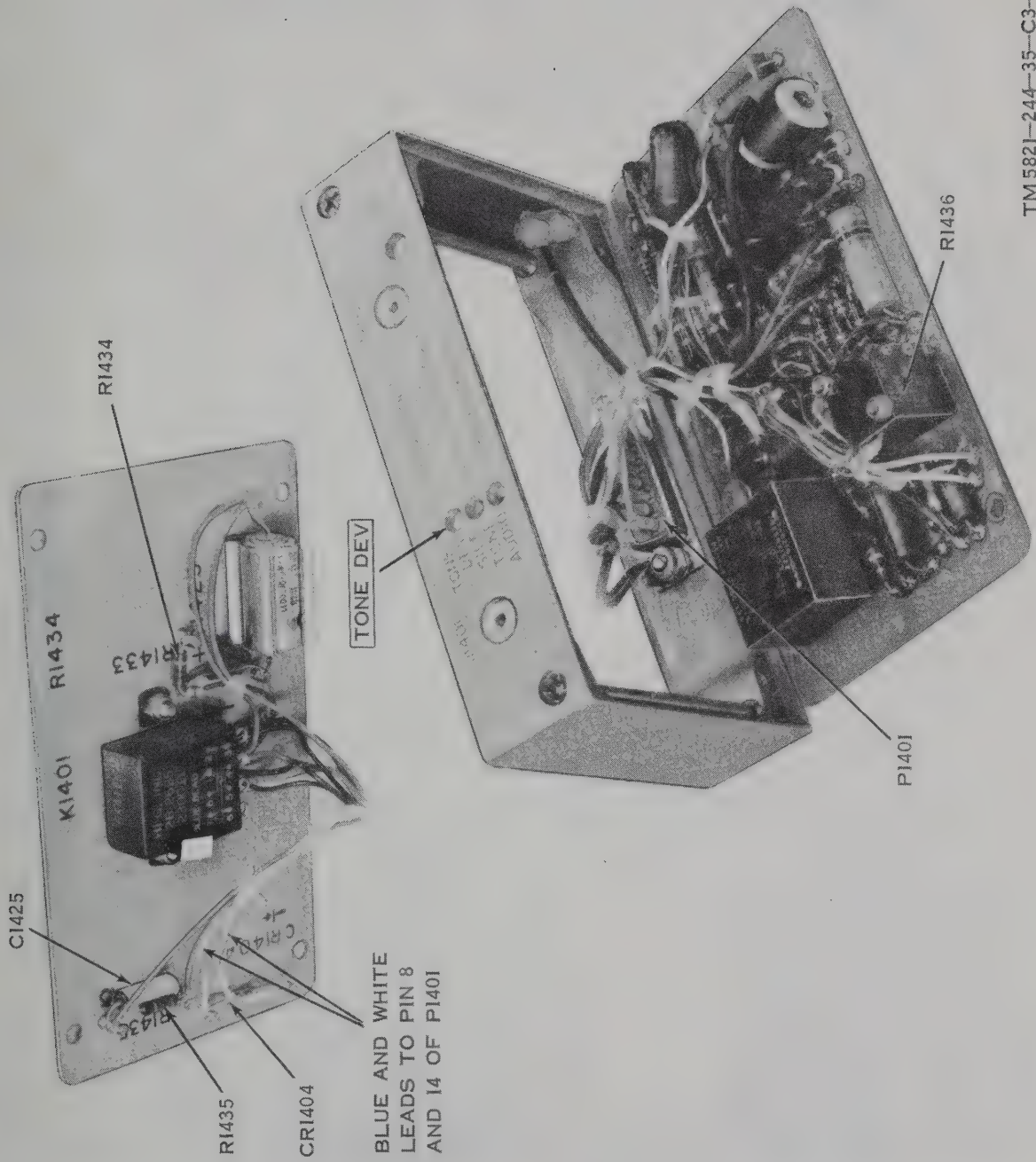
3



4

5





TM 5821-244-35-C3-1

Figure 4-30.3. Transmit audio module, showing (X) mode modification on modules containing TONE DEV Potentiometer.

5-6. Test Meter Tests

- a. *Test Equipment and Materials.* Maintenance Kit, Electronic Equipment MK-733/ARC-54.
 b. *Test Connections and Conditions.* Connect equipment as shown in figure 5-1.
 c. *Procedure.*

Step No.	Control settings		Test procedure	Performance standard																																																		
	Test equipment	Equipment under test																																																				
1	TS-1967/ARC-54 S3: 30. S4: 0. S5: 0.95 S6: RCV S7: DIS (Set to TONE for position 5 test). S9: PTT. S10: RADIO. S11: TEST SET. All other switches: Any position. POWER circuit breaker: ON.	RT-348/ARC-54 TEST SWITCH: Set as instructed in Test procedure column.	Beginning at position 1, successively select each position of the RT-348/ARC-54 TEST SWITCH and note the indication on the RT-348/ARC-54 TEST METER for each position. Note. Set S7 on the test set to TONE when checking position 5.	Observe the following: <table><thead><tr><th>Position</th><th>Reading</th></tr></thead><tbody><tr><td>1</td><td>50 ± 30</td></tr><tr><td>2</td><td>50 ± 30</td></tr><tr><td>3</td><td>50 ± 30</td></tr><tr><td>4</td><td>50 ± 30</td></tr><tr><td>5</td><td>NMT a 20 (average).</td></tr><tr><td>6</td><td>50 ± 30</td></tr><tr><td>7</td><td>NMT 5</td></tr><tr><td>8</td><td>NMT 5</td></tr><tr><td>9</td><td>NMT 5</td></tr><tr><td>10</td><td>NMT 5</td></tr><tr><td>11</td><td>NMT 5</td></tr><tr><td>12</td><td>NMT 5</td></tr></tbody></table> a. Observe the following: <table><thead><tr><th>Position</th><th>Reading</th></tr></thead><tbody><tr><td>1</td><td>50 ± 30</td></tr><tr><td>2</td><td>50 ± 30</td></tr><tr><td>3</td><td>50 ± 30</td></tr><tr><td>4</td><td>50 ± 30</td></tr><tr><td>5</td><td>50 ± 30</td></tr><tr><td>6</td><td>50 ± 30</td></tr><tr><td>7</td><td>NLT b 5</td></tr><tr><td>8</td><td>NLT 20</td></tr><tr><td>9</td><td>50 ± 30</td></tr><tr><td>10</td><td>NLT 20</td></tr><tr><td>11</td><td>NMT 5</td></tr></tbody></table> b. The reading for position 11 should be 50 ± 30.	Position	Reading	1	50 ± 30	2	50 ± 30	3	50 ± 30	4	50 ± 30	5	NMT a 20 (average).	6	50 ± 30	7	NMT 5	8	NMT 5	9	NMT 5	10	NMT 5	11	NMT 5	12	NMT 5	Position	Reading	1	50 ± 30	2	50 ± 30	3	50 ± 30	4	50 ± 30	5	50 ± 30	6	50 ± 30	7	NLT b 5	8	NLT 20	9	50 ± 30	10	NLT 20	11	NMT 5
Position	Reading																																																					
1	50 ± 30																																																					
2	50 ± 30																																																					
3	50 ± 30																																																					
4	50 ± 30																																																					
5	NMT a 20 (average).																																																					
6	50 ± 30																																																					
7	NMT 5																																																					
8	NMT 5																																																					
9	NMT 5																																																					
10	NMT 5																																																					
11	NMT 5																																																					
12	NMT 5																																																					
Position	Reading																																																					
1	50 ± 30																																																					
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3	50 ± 30																																																					
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5	50 ± 30																																																					
6	50 ± 30																																																					
7	NLT b 5																																																					
8	NLT 20																																																					
9	50 ± 30																																																					
10	NLT 20																																																					
11	NMT 5																																																					
2	TS-1967/ARC-54 S3: 60. S4: 7. S5: 0.06. S6: XMIT. S7: DIS. S9: PTT. S10: RADIO. S11: TEST SET. POWER circuit breaker: ON. All other switches: Any position.	RT-348/ARC-54 TEST SWITCH: Set as instructed in Test procedure column.	a. Beginning at position 1, successively select each position of the RT-348 TEST SWITCH and observe the reading on the RT-348 TEST METER for each position. b. Set S6 on the TS-1967 to RCV and remove the jumper between J2 and J5. Momentarily depress S6 to PTT and note the RT-348 TEST METER indication.																																																			

^aNMT=Not more than.

^bNLT=Not less than.

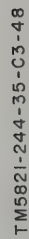


Figure 5-2. Transmitter power output test setup.

5-7. Transmitter Power Output and Frequency Accuracy

a. *Test Equipment and Materials.* Maintenance Kit, Electronic Equipment MK-733/ARC-54, and Frequency Counter AN/USM-26.

b. *Test Connections and Conditions.* Connect equipment as shown in figure 5-2. Turn the POWER circuit breaker on the TS-1967 to ON and allow 5 minutes for warmup.

c. Procedure.

[illegible]

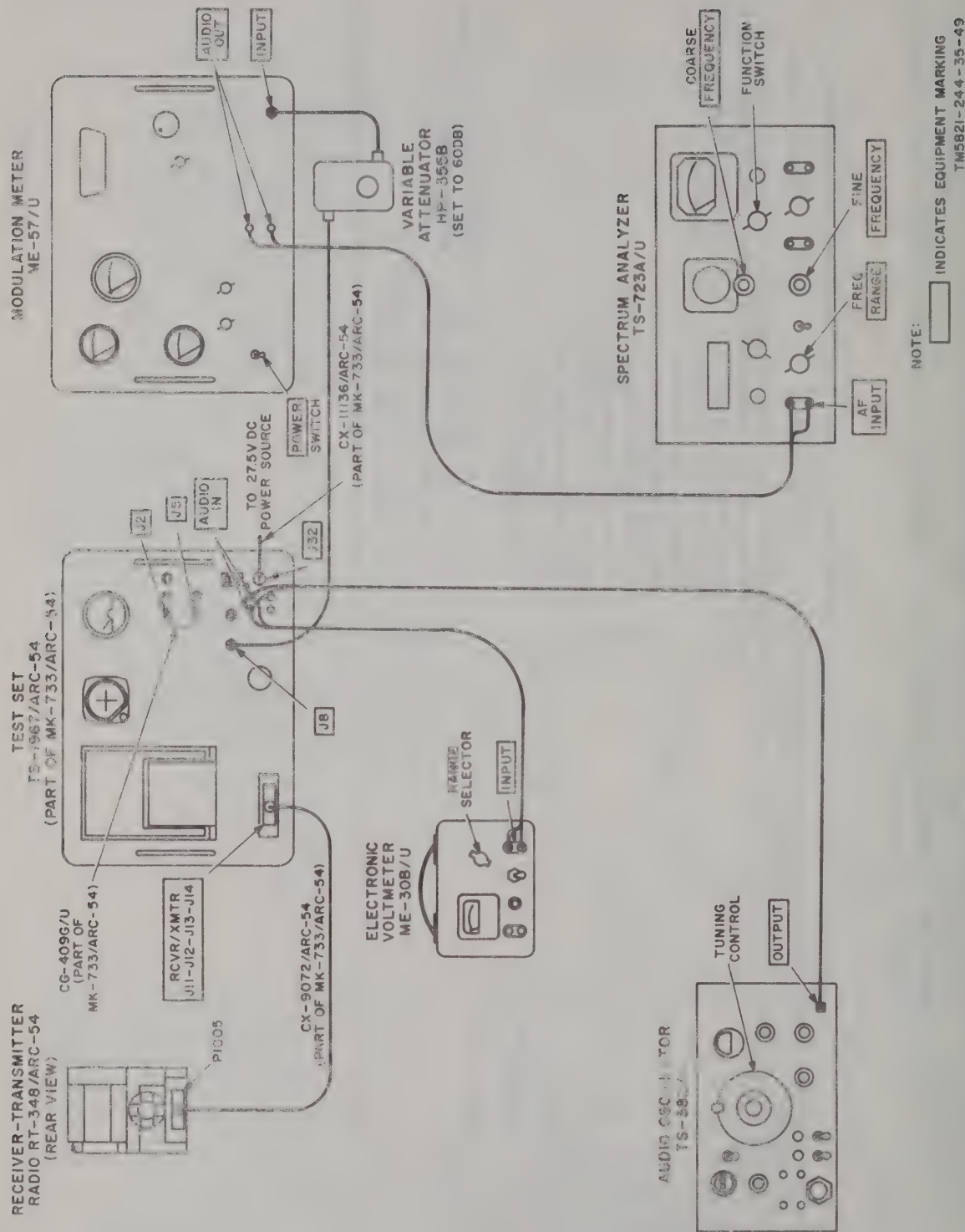
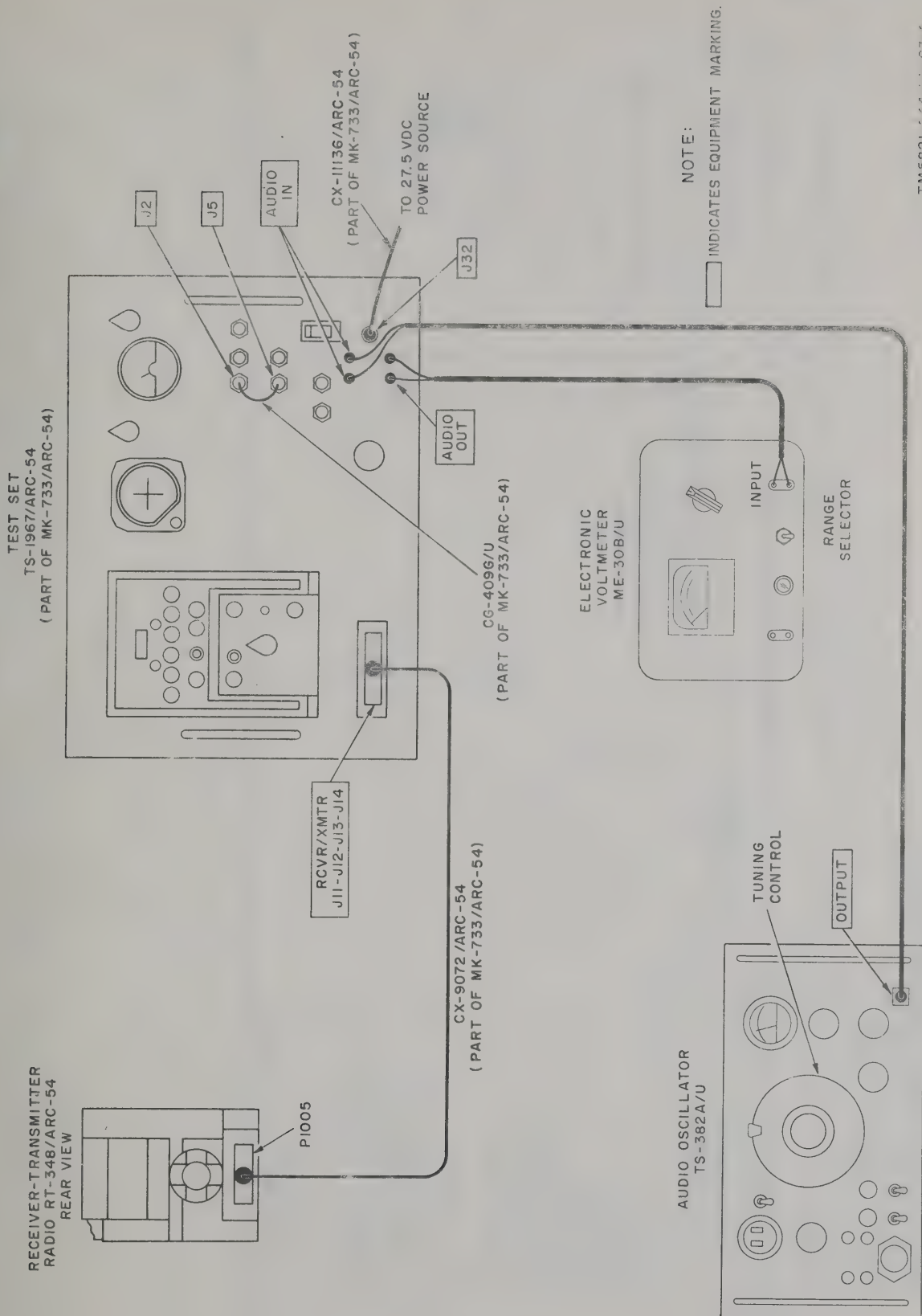


Figure 5-3. Transmitter distortion test setup.



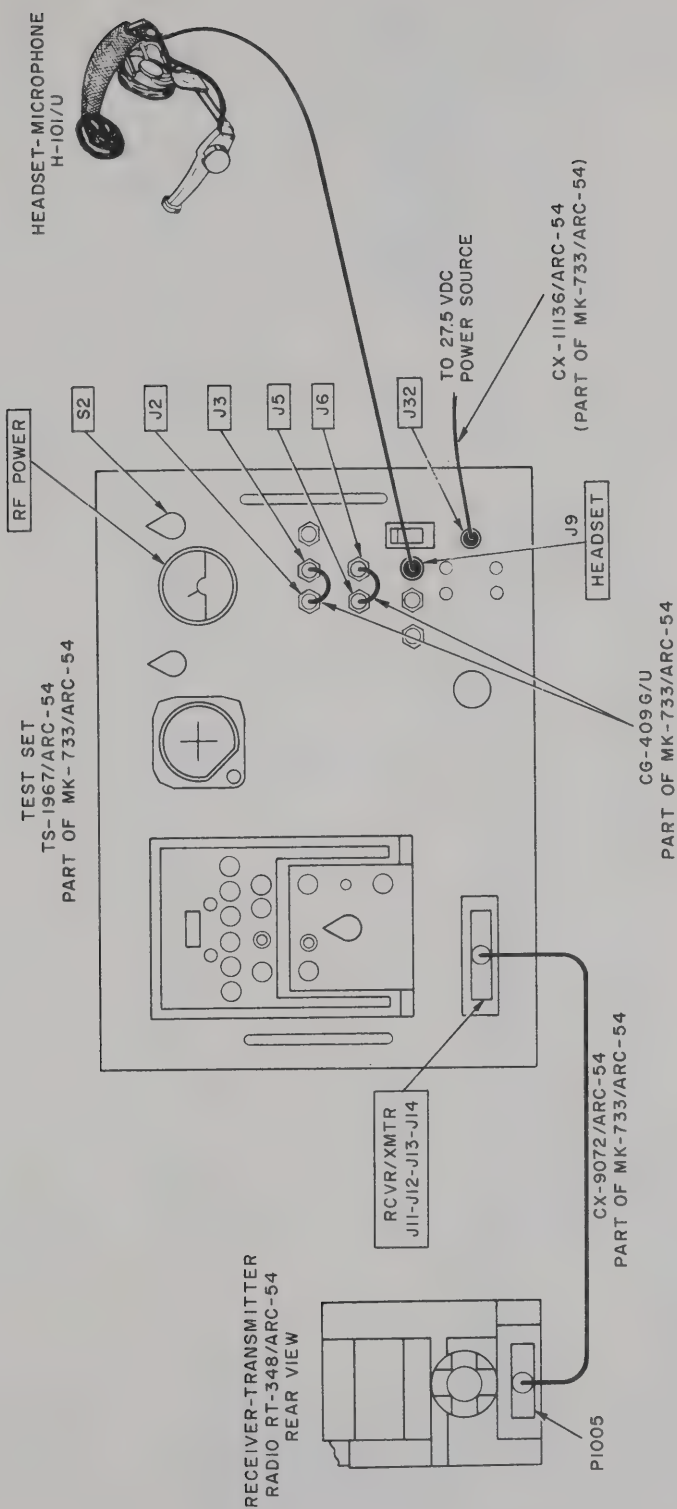
TM 5821-244-35-03-4

Figure 5-5.1. Sidetone level test setup.

5-10.1. Sidetone Level

- a. *Test Equipment and Materials.*
Maintenance Kit, Electronic Equipment MK-733/ARC-54.
Receiver-Transmitter, Radio RT-348/ARC-54.
Voltmeter, Electronic ME-30B/U.
Audio Oscillator, TS-382/U.
- b. *Test Connections and Conditions.* Connect the equipment as shown in figure 5-5.1. Turn on the equipment.
- c. *Procedure.*

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	TS-1967/ARC-54 S3: 30 S4: 1 S5: 0.00 S6: RCV S8: OFF S9: TEST S10: RADIO S11: TEST SET POWER: ON TS-382/U Main tuning dial: 100 RANGE switch: X10. ATTENUATOR: X1, Output level control: for 0.37 volts output. ME-30B/U Range selector: 3 volts rms.	None	a. Set S6 on TS-1967/ARC-54 to XMIT. b. Observe sidetone output on ME-30B/U.	a. None. b. Between 1.2-1.4 volts rms.



TM 5821-244-35-C3-7

NOTE:
[] INDICATES EQUIPMENT MARKING.

Figure 5-12.1. Channel changing tone test setup.

5-17.1. Channel Changing Tone

a. Test Equipment and Materials.

Maintenance Kit, Electronic Equipment MK-733/ARC-54
Receiver-Transmitter, Radio RT-348/ARC-54.
Headset-Microphone H-101A/U.

b. Test Conditions and Connections. Connect the equipment as shown in figure 5-12.1.

c. Procedure.

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	TS-1967/ARC-54 S3: 30. S4: 1. S5: 0.00. S6: Rcv. S8: off. S9: PTT. S10: RADIO. S11: TEST SET. POWER: ON.	None	Change S3 to 40	Observe the presence of approximately 800-cps tone in headset which continues during the changing cycle.

5-23. Conductance and Susceptance Charts

a. Antenna Coupler CU-942/ARC-54.

Frequency (mc)	Conductance		Susceptance	
	From—	To—	From—	To—
30.50-----	0.2	1.5	13.1	15.5
31.50-----	0.1	1.4	13.0	15.4
32.50-----	0.2	1.5	13.3	15.7
33.50-----	0.2	1.5	13.0	15.4
34.50-----	0.6	1.8	12.4	14.8
35.50-----	0.2	1.5	12.2	14.6
36.50-----	0.2	1.5	11.8	14.2
37.50-----	0.3	1.6	11.5	13.9
38.50-----	0.5	1.5	10.6	13.0
39.50-----	0.6	1.8	10.1	12.5
40.50-----	0.9	2.9	9.4	11.8
41.50-----	1.4	3.4	9.2	11.6
42.50-----	1.5	3.5	8.1	10.1
43.50-----	2.2	4.2	7.7	9.7
44.50-----	3.5	5.5	6.6	8.6
45.50-----	4.0	6.0	5.0	7.0
46.50-----	4.7	6.7	4.2	5.6
47.50-----	6.0	7.8	2.8	4.2
48.50-----	6.6	8.0	1.1	2.5
49.50-----	6.5	7.7	-0.4	1.0
50.50-----	6.3	7.7	-2.3	-3.7
51.50-----	6.2	8.0	-2.9	-4.3
52.50-----	6.4	8.2	-4.3	-5.7
53.50-----	6.3	7.9	-5.3	-6.7
54.50-----	6.5	8.2	-6.3	-7.9
55.50-----	6.0	8.0	-7.5	-9.9
56.50-----	6.3	8.2	-8.9	-10.3
57.50-----	5.8	7.8	-10.2	-11.6
58.50-----	5.9	7.5	-10.9	-12.3
59.50-----	5.7	7.2	-10.9	-12.3
60.50-----	6.3	8.7	-13.1	-14.5
61.50-----	5.8	8.0	-13.0	-14.4
62.50-----	5.6	7.3	-13.1	-14.5
63.50-----	4.9	6.8	-12.8	-14.2
64.50-----	4.4	5.9	-11.8	-13.2
65.50-----	4.4	5.9	-12.6	-14.0
66.50-----	3.7	5.2	-11.8	-13.2
67.50-----	3.3	4.7	-11.3	-12.7
68.50-----	2.6	4.0	-10.4	-11.8
69.50-----	2.6	4.8	-10.4	-11.8

b. Antenna Coupler CU-943/ARC-54.

Frequency (mc)	Conductance		Susceptance	
	From—	To—	From—	To—
30.50-----	0.1	1.0	13.8	16.2
31.50-----	0.1	1.0	14.0	16.4
32.50-----	0.2	1.2	14.0	16.4
33.50-----	0.3	1.4	14.1	16.5
34.50-----	0.5	2.3	13.5	15.9
35.50-----	0.4	2.0	13.2	15.6
36.50-----	0.6	2.5	12.5	14.9
37.50-----	0.5	2.3	11.9	14.3
38.50-----	0.4	2.0	11.0	13.4
39.50-----	0.9	1.3	10.4	12.8
40.50-----	1.5	2.9	9.9	12.3
41.50-----	2.0	3.0	9.9	12.3
42.50-----	2.3	3.7	9.9	12.3
43.50-----	2.9	4.3	8.0	9.4
44.50-----	4.3	5.7	7.1	8.5
45.50-----	4.8	6.2	5.3	6.7
46.50-----	5.6	7.0	4.3	5.7
47.50-----	6.5	7.9	2.8	4.2
48.50-----	6.8	8.2	0.9	2.3
49.50-----	6.6	8.0	0.2	-1.2
50.50-----	7.1	8.5	-1.8	-3.2
51.50-----	7.1	8.5	-2.5	-3.9
52.50-----	7.0	8.4	-4.1	-5.5
53.50-----	6.7	8.1	-5.3	-6.7
54.50-----	6.6	8.0	-6.5	-7.9
55.50-----	6.3	7.7	-7.8	-9.2
56.50-----	6.1	7.5	-9.2	-10.2
57.50-----	5.7	6.1	-10.3	-11.7
58.50-----	5.0	6.4	-10.8	-12.2
59.50-----	5.1	6.5	-11.0	-12.4
60.50-----	5.9	7.3	-13.5	-14.9
61.50-----	5.4	6.8	-13.0	-14.4
62.50-----	4.9	6.3	-13.1	-14.5
63.50-----	4.6	6.0	-12.8	-14.2
64.50-----	3.8	5.2	-11.8	-13.2
65.50-----	3.9	5.3	-12.7	-14.1
66.50-----	3.2	4.6	-11.7	-13.1
67.50-----	2.8	4.2	-10.8	-12.2
68.50-----	2.3	3.7	-10.0	-11.4
69.50-----	2.3	3.7	-10.1	-11.5

	except: TS-1967/ARC-54 S3: 60. S4: 8. S5: 0.95. AN/URM-48 Tune to 68.95 megacycles.			using center frequency of 68.95 MC.	
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5-23. Conductance and Susceptance Charts*a. Antenna Coupler CU-942/ARC-54.*

Frequency (mc)	Conductance		Susceptance	
	From—	To—	From—	To—
30.50-----	0.2	1.5	13.1	15.5
31.50-----	0.1	1.4	13.0	15.4
32.50-----	0.2	1.5	13.3	15.7
33.50-----	0.2	1.5	13.0	15.4
34.50-----	0.6	1.8	12.4	14.8
35.50-----	0.2	1.5	12.2	14.6
36.50-----	0.2	1.5	11.8	14.2
37.50-----	0.3	1.6	11.5	13.9
38.50-----	0.5	1.5	10.6	13.0
39.50-----	0.6	1.8	10.1	12.5
40.50-----	0.9	2.9	9.4	11.8
41.50-----	1.4	3.4	9.2	11.6
42.50-----	1.5	3.5	8.1	10.1
43.50-----	2.2	4.2	7.7	9.7
44.50-----	3.5	5.5	6.6	8.6
45.50-----	4.0	6.0	5.0	7.0
46.50-----	4.7	6.7	4.2	5.6
47.50-----	6.0	7.8	2.8	4.2
48.50-----	6.6	8.0	1.1	2.5
49.50-----	6.5	7.7	-0.4	1.0
50.50-----	6.3	7.7	-2.3	-3.7
51.50-----	6.2	8.0	-2.9	-4.3
52.50-----	6.4	8.2	-4.3	-5.7
53.50-----	6.3	7.9	-5.3	-6.7
54.50-----	6.5	8.2	-6.3	-7.9
55.50-----	6.0	8.0	-7.5	-9.9
56.50-----	6.3	8.2	-8.9	-10.3
57.50-----	5.8	7.8	-10.2	-11.6
58.50-----	5.9	7.5	-10.9	-12.3
59.50-----	5.7	7.2	-10.9	-12.3
60.50-----	6.3	8.7	-13.1	-14.5
61.50-----	5.8	8.0	-13.0	-14.4
62.50-----	5.6	7.3	-13.1	-14.5
63.50-----	4.9	6.8	-12.8	-14.2
64.50-----	4.4	5.9	-11.8	-13.2
65.50-----	4.4	5.9	-12.6	-14.0
66.50-----	3.7	5.2	-11.8	-13.2
67.50-----	3.3	4.7	-11.3	-12.7
68.50-----	2.6	4.0	-10.4	-11.8
69.50-----	2.6	4.8	-10.4	-11.8

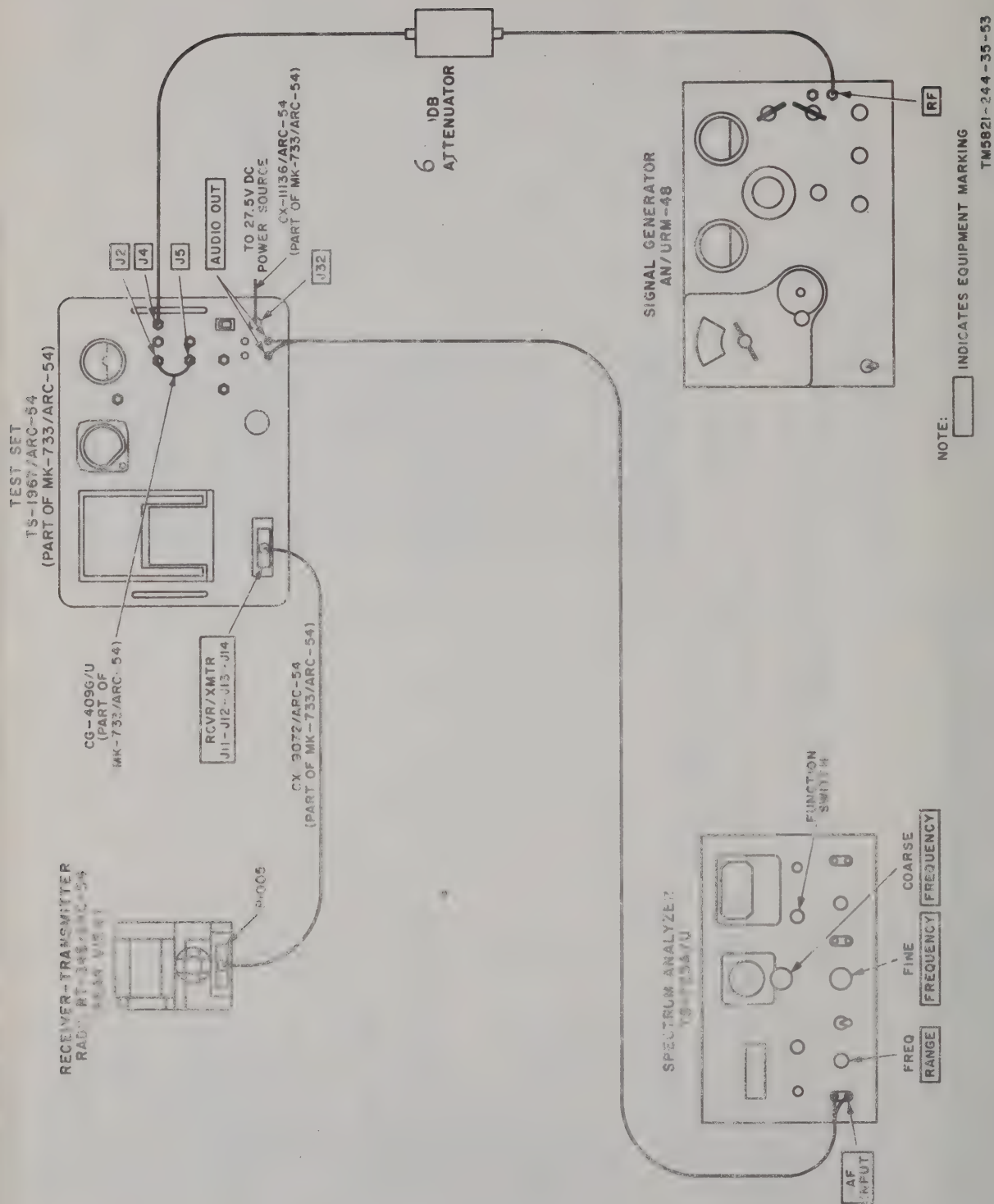
b. Antenna Coupler CU-943/ARC-54.

Frequency (mc)	Conductance		Susceptance	
	From—	To—	From—	To—
30.50-----	0.1	1.0	13.8	16.2
31.50-----	0.1	1.0	14.0	16.4
32.50-----	0.2	1.2	14.0	16.4
33.50-----	0.3	1.4	14.1	16.5
34.50-----	0.5	2.3	13.5	15.9
35.50-----	0.4	2.0	13.2	15.6
36.50-----	0.6	2.5	12.5	14.9
37.50-----	0.5	2.3	11.9	14.3
38.50-----	0.4	2.0	11.0	13.4
39.50-----	0.9	1.3	10.4	12.8
40.50-----	1.5	2.9	9.9	12.3
41.50-----	2.0	3.0	9.9	12.3
42.50-----	2.3	3.7	9.9	12.3
43.50-----	2.9	4.3	8.0	9.4
44.50-----	4.3	5.7	7.1	8.5
45.50-----	4.8	6.2	5.3	6.7
46.50-----	5.6	7.0	4.3	5.7
47.50-----	6.5	7.9	2.8	4.2
48.50-----	6.8	8.2	0.9	2.3
49.50-----	6.6	8.0	0.2	-1.2
50.50-----	7.1	8.5	-1.8	-3.2
51.50-----	7.1	8.5	-2.5	-3.9
52.50-----	7.0	8.4	-4.1	-5.5
53.50-----	6.7	8.1	-5.3	-6.7
54.50-----	6.6	8.0	-6.5	-7.9
55.50-----	6.3	7.7	-7.8	-9.2
56.50-----	6.1	7.5	-9.2	-10.2
57.50-----	5.7	6.1	-10.3	-11.7
58.50-----	5.0	6.4	-10.8	-12.2
59.50-----	5.1	6.5	-11.0	-12.4
60.50-----	5.9	7.3	-13.5	-14.9
61.50-----	5.4	6.8	-13.0	-14.4
62.50-----	4.9	6.3	-13.1	-14.5
63.50-----	4.6	6.0	-12.8	-14.2
64.50-----	3.8	5.2	-11.8	-13.2
65.50-----	3.9	5.3	-12.7	-14.1
66.50-----	3.2	4.6	-11.7	-13.1
67.50-----	2.8	4.2	-10.8	-12.2
68.50-----	2.3	3.7	-10.0	-11.4
69.50-----	2.3	3.7	-10.1	-11.5

5-11. Audio Output and Distortion Test

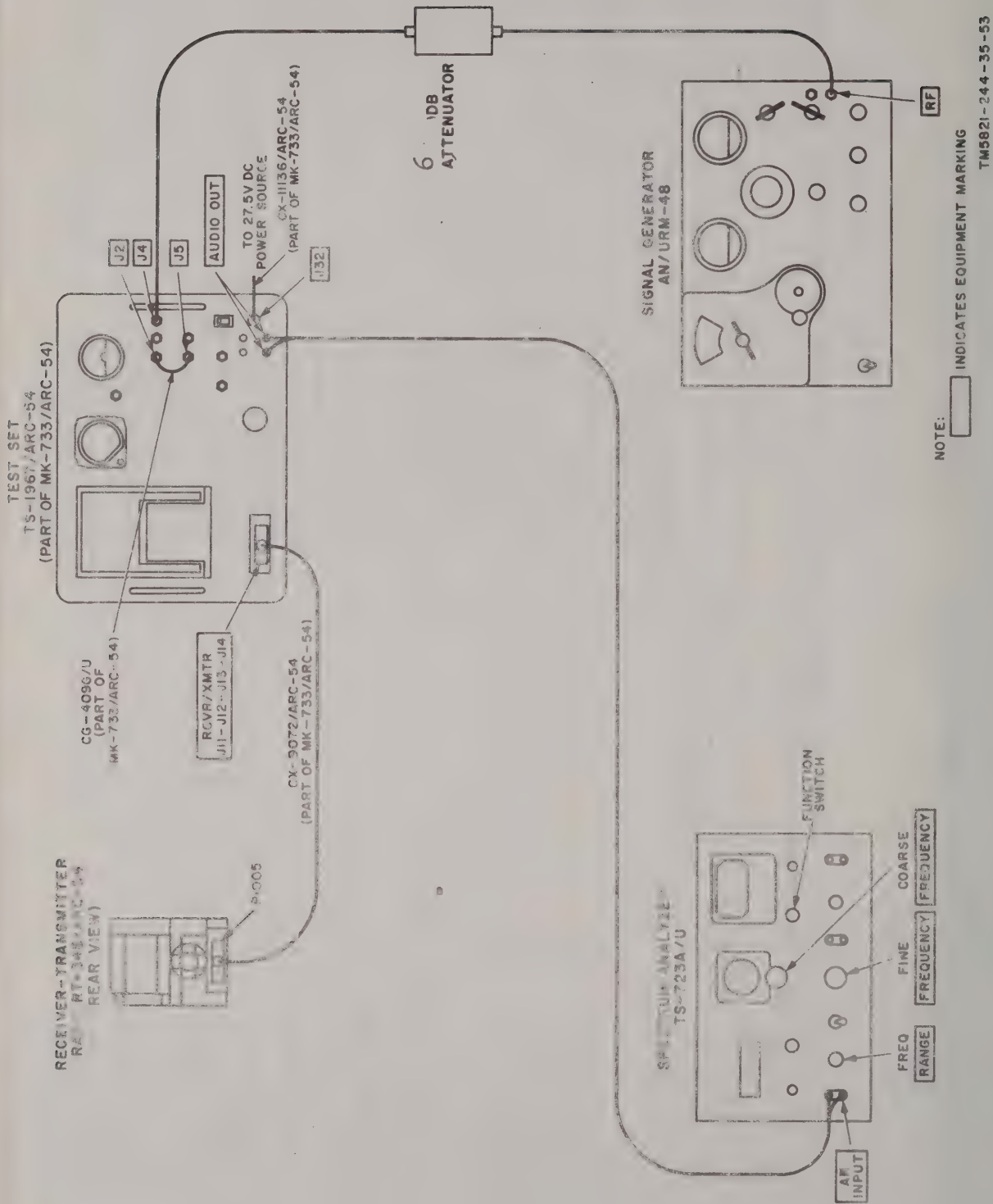
- a. *Test Equipment and Materials.*
Maintenance Kit, Electronic Equipment MK-733/ARC-54.
Attenuator, 20 db.
Signal Generator AN/URM-48.
Audio Oscillator TS-382/U.
Spectrum Analyzer TS-723A/U.
- b. *Test Connections and Conditions.* Remove the dust cover from the RT-348/ARC-54 and connect the equipment as shown in figure 5-6; then turn the equipment on and allow 5 minutes for warmup.
- c. *Procedure.*

Step No.	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	<i>TS-1967/ARC-54</i> S3: 30 S4: 1. S5: 0.00. S6: RCV. S7: DIS. S8: OFF. S9: TEST. S10: RADIO. S11: TEST SET. All other switches: Any position. POWER circuit breaker ON. <i>AN/URM-48</i> BANDSWITCH: B RF TUNING: 31 mc. DEVIATION RANGE: 25 OPERATION switch: MOD OFF. RF SET TO LINE: Set for redline indication on meter. RF ATTENUATOR: 0 microvolts. DEVIATION LEVEL: Max ccw. <i>TS-382/U</i> Main tuning dial: 100. ATTENUATOR: 10. Output level control: Max ccw. RANGE switch: X10. <i>TS-723A/U</i> FUNCTION switch: METER. Meter range switch: 0.3 RMS volts. Coarse FREQUENCY: 100. RANGE switch: X10. INPUT control: MIN. AF-RF selector: AF.	None.	a. Adjust TS-382/U output level control clockwise until AN/URM-48 DEVIATION meter indicates 10 kilocycles. b. Note no-signal noise level on TS-723A/U (using METEP function). Set AN/URM-48 RF ATTENUATOR to 120 and adjust RF TUNING dial to center frequency by tuning for null on TS-723A/U. Reduce AN/URM-48 output until noise level on TS-723A/U is 5 db less than level noted above. Repeat procedure, tuning for null each time signal is reduced until no further null can be obtained. c. Set AN/URM-48 OPERATION switch to EXT MOD and adjust TS-382/U output level to deviate carrier 10 kc as indicated on AN/URM-48 DEVIATION meter. d. Set AN/URM-48 RF MICROVOLTS dial to 120. e. Tune TS-723A/U to audio-frequency by setting function switch to DISTORTION and tuning TS-723/U for minimum meter reading. f. Measure distortion. g. Measure audio level. (Use TS-723A/U METER function.)	a. None. b. None. c. None. d. None. e. None. f. Not more than 8%. g. 1.93 to 3.06 volts.
2	Leave controls as in step 1, except: <i>TS-382/U</i> Main tuning dial: 30. RANGE switch: X10. Output level: Readjust to maintain 10-kc deviation on DEVIATION meter.	None.	Repeat step 1 with TS-382/U adjusted for 300 cps output.	Same as step 1.
3	Leave controls as in step 1, except: <i>TS-382/U</i> Main tuning dial: 60. RANGE switch: X100. Output level: Readjust to maintain 10-kc deviation.	None.	Repeat step 1 with TS-382/U adjusted for 6,000-cps output.	Same as step 1, except audio level should be between 0.815 and 1.62 volts.
4	Set controls as in step 1, except: <i>TS-1967/ARC-54</i> S3: 50. S4: 0. S5: 50. <i>AN/URM-48</i> Tune to 50.50 megacycles.	None.	Repeat steps 1, 2, and 3, using center frequency of 50.50 MC.	Same as steps 1, 2, and 3.
5	Set controls as in step 1, except: <i>TS-1967/ARC-54</i> S3: 60. S4: 8. S5: 0.95. <i>AN/URM-48</i> Tune to 68.95 megacycles.	None.	Repeat steps 1, 2, and 3, using center frequency of 68.95 MC.	Same as steps 1, 2, and 3.



TM5821-244-35-53

Figure 5-7. Receiver sensitivity, quieting, and limiting test setup.



TM5821-244-35-53

Figure 5-7. Receiver sensitivity, quieting, and limiting test setup.

5-12. Receiver Sensitivity, Quieting, and Limiting

- a. *Test Equipment and Materials.*
Maintenance Kit, Electronic Equipment MK-733/ARC-54.
Spectrum Analyzer TS-723A/U.
Signal Generator AN/URM-48.
Attenuator, 6 db.
- b. *Test Connections and Conditions.* Connect the equipment as shown in figure 5-7. Turn the equipment on.
- c. *Procedure.*

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	<i>TS-1967/ARC-54</i> S3: 30. S4: 1. S5: 0.00. S6: RCV. S7: DIS. S8: OFF. S9: TEST. S10: RADIO. S11: TEST SET. All other switches: Any position. POWER circuit breaker: ON. <i>AN/URM-48</i> BANDSWITCH: C. RF TUNING: 31 mc. DEVIATION RANGE: 25. OPERATION switch: MOD OFF. RF SET TO LINE: Set for redline indication on meter. RF ATTENUATOR: 0 microvolts. DEVIATION LEVEL: Max ccw. <i>TS-723/U</i> Function switch: METER. Coarse FREQUENCY: 100. RANGE switch: X10. AF-RF switch: AF. FINE FREQUENCY tune: Tune as directed in <i>Test procedure</i> column. BALANCE: Adjust for minimum meter indication (after 1-KC modulation has been applied). Meter range switch: Set to 0.3 volts rms scale. INPUT control: MIN.	None.	a. Note no-signal noise level on TS-723A/U meter. Set AN/URM-48 RF ATTENUATOR MICROVOLTS to 120 and tune AN/URM-48 to exact receiver frequency by tuning for null on meter. When null is obtained, reduce AN/URM-48 output until TS-723A/U indicates 5 db less than no-signal level noted above. Retune for null. Repeat above procedure until maximum null is obtained. b. Set AN/URM-48 OPERATION switch to 1000$\wedge$. Set AN/URM-48 DEVIATION LEVEL for 10KC deviation as indicated on AN/URM-48 DEVIATION meter. Adjust AN/URM-48 RF ATTENUATOR MICROVOLTS to 1.2. c. Set TS-723A/U function switch to METER, and meter range switch to 3 volts rms, and adjust R1315 (GAIN adjust) on RT-348/ARC-54 receive audio module for reading on TS-723A/U meter of 2.73 volts rms. d. Set AN/URM-48 OPERATION switch to MOD OFF and note decrease in reading on TS-723A/U meter. e. Increase AN/URM-48 RF ATTENUATOR MICROVOLTS setting to 120 microvolts, set OPERATION switch to 1000$\wedge$, and note reading on TS-723A/U meter. f. Set AN/URM-48 OPERATION switch to MOD OFF and note decrease in reading on TS-723A/U meter. g. Set AN/URM-48 OPERATION switch to 1000$\wedge$. h. Vary AN/URM-48 RF ATTENUATOR MICROVOLTS from 6 to 10K microvolts, observing TS-723A/U meter.	a. None. b. None. c. 2.73 volts rms audio output. d. The audio output should decrease at least 10 db. e. None. f. Audio output should decrease 40 db. (To read this change, set meter range to -30 db and add -30 db algebraically to meter db reading). g. None. h. Audio output should not vary more than 2 db.
2	Set controls as in step 1, except: <i>TS-1967/ARC-54</i> S3: 50. S4: 0. S5: 0.50 <i>AN/URM-48</i> RF TUNING: 50.50 megacycles.	None.	Repeat step 1, with equipment tuned to 50.50 megacycles.	Same as step 1.
3	Set controls as in step 1, except: <i>TS-1967/ARC-54</i> S3: 60. S4: 8. S5: 0.95. <i>AN/URM-48</i> BANDSWITCH: D. RF TUNING: 68.95 megacycles.	None.	Repeat step 1 with equipment tuned to 68.95 megacycles.	Same as step 1.

5-13. Receiver Squelch Adjustment

a. Test Equipment and Materials.

Maintenance Kit, Electronic Equipment MK-733/ARC-54.
Electronic Voltmeter, ME-30B/U.

Signal Generator AN/TDM 48

			transmitter until receiver just unsquelches (sharp increase in ME-30B/U indication). Note AN/URM-48 RF ATTENUATOR MICROVOLTS setting.	
			d. Slowly decrease AN/URM-48 RF ATTENUATOR MICROVOLTS setting until receiver just squelches (sharp decrease in meter indication), and note difference in microvolts of input (AN/URM-48 RF ATTENUATOR MICROVOLTS) between receiver unsquelch and receiver squelch.	d. Difference in RF input required for squelch and unsquelch should be 0.6 microvolt or less.
			e. Repeat a through d above for carrier frequencies of 50.50 and 68.95 MC.	e. Same as a through d above.

5-13. Receiver Squelch Adjustment

- a. *Test Equipment and Materials.*
Maintenance Kit, Electronic Equipment MK-733/ARC-54.
Electronic Voltmeter, ME-30B/U.
Signal Generator AN/URM-48.
Attenuator, 20 db.
- b. *Test Connections and Conditions.* Connect the equipment as shown in figure 5-8.
- c. *Procedure.*

Step	Control settings		Test procedure	Performance standard
	Test equipment	Equipment under test		
1	TS-1967/ARC-54 S3: 30. S4: 1. S5: 0.00. S6: RCV. S7: DIS. S8: OFF. S9: TEST. S10: RADIO. S11: TEST SET. All other switches: Any position. POWER circuit breaker: ON. AN/URM-48 BANDSWITCH: B. RF TUNING: 31 MC. DEVIATION RANGE: 25. OPERATION switch: MOD OFF. RF SET TO LINE: Set for redline indication on meter. RF ATTENUATOR MICROVOLTS: 100 microvolts. DEVIATION LEVEL: Max ccw. ME-30B/U. Range selector: Set to any range that gives readable indication, and lower range as necessary for nulling.	RT-348 SQ ADJ: Fully clockwise.	a. Tune AN/URM-48 to receiver frequency by tuning for minimum noise (as described in para. 5-12c, step 1). (Set ME-30B/U range selector to 3-volt range after tuning.) b. Set S7 on TS-1967/ARC-54 to CARR, and set AN/NRM-48 OPERATION switch to 1000^ and DEVIATION LEVEL control for 10KC deviation as measured on AN/URM-48 DEVIATION meter. c. Set AN/URM-48 RF ATTENUATOR MICROVOLTS dial to 0.1 microvolt. Slowly increase RF ATTENUATOR MICROVOLTS dial setting until ME-30B/U indicates receiver unsquelching (sharp increase in meter reading). Note reading on ME-30B/U.	a. None. b. None. c. Receiver should unsquelch at RF ATTENUATOR setting of 6 microvolts or less.
2	Leave controls as in step 1.	RT-348 SQ ADJ: Set as instructed in Test procedure column.	a. Set AN/URM-48 RF ATTENUATOR MICROVOLTS dial to 0.6 microvolt and measure the output on the ME-30B/U. b. Set AN/URM-48 RF ATTENUATOR MICROVOLTS to 1.2, OPERATION switch to 1000^, and DEVIATION LEVEL for 10KC deviation as measured on DEVIATION meter. c. Adjust SQ ADJ on reveiver-transmitter until receiver just unsquelches (sharp increase in ME-30B/U indication). Note AN/URM-48 RF ATTENUATOR MICROVOLTS setting. d. Slowly decrease AN/URM-48 RF ATTENUATOR MICROVOLTS setting until receiver just squelches (sharp decrease in meter indication), and note difference in microvolts of input (AN/URM-48 RF ATTENUATOR MICROVOLTS) between receiver unsquelch and receiver squelch. e. Repeat a through d above for carrier frequencies of 50.50 and 68.95 MC.	a. Audio output should decrease at least 45 db from previous level. b. None. c. None. d. Difference in RF input required for squelch and unsquelch should be 0.6 microvolt or less. e. Same as a through d above.

5-16. Receiver Selectivity

a. Test Equipment and Materials.

Maintenance Kit, Electronic Equipment MK-733/ARC-54.

Frequency Meter AN/USM-26 with Frequency Converter CV-394/USA-5.

Attenuators: One HP-355A, one HP-355B.

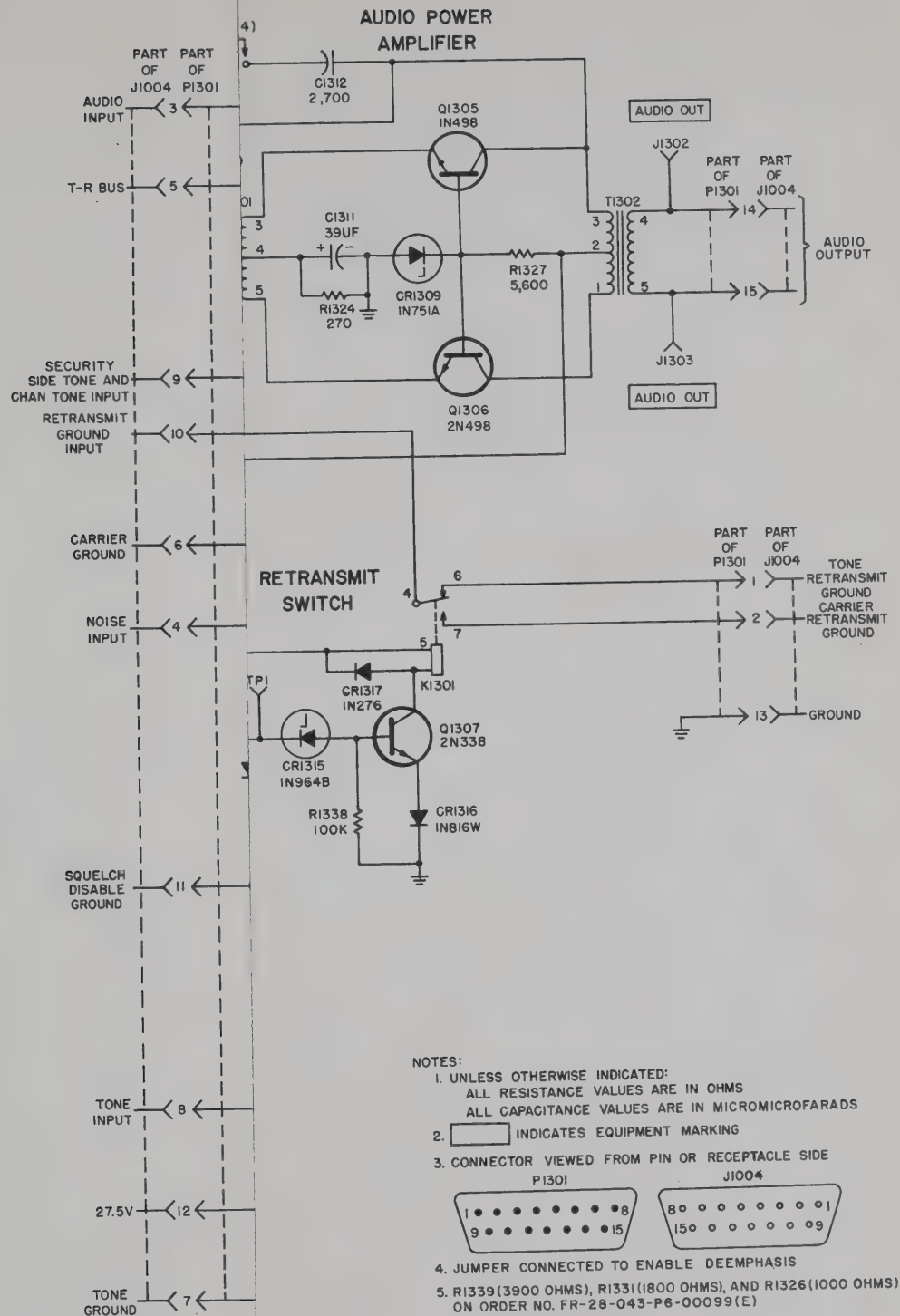
Voltmeter, Electronic ME 200/11.

			g. Decrease HP-355B attenuator to 80 db below attenuation recorded in <i>d</i> above. Again vary AN/USM-44A FREQ control above and below center frequency, noting frequencies at which voltage indicated on ME-26A/U agrees with voltage recorded in <i>d</i> above. h. Repeat <i>a</i> through <i>g</i> above, with TS-1967/ARC-54 and AN/USM-44 tuned to frequencies of 50.50 and 68.95 megacycles.	g. Difference between two frequencies should not be more than 100KC h. Same as <i>e</i>, <i>f</i>, and <i>g</i> above.
--	--	--	---	--

5-16. Receiver Selectivity

- a. *Test Equipment and Materials.*
Maintenance Kit, Electronic Equipment MK-733/ARC-54.
Frequency Meter AN/USM-26 with Frequency Converter CV-394/USA-5.
Attenuators: One HP-355A, one HP-355B.
Voltmeter, Electronic ME-30B/U.
Signal Generator AN/USM-44A.
Multimeter ME-26A/U.
- b. *Test Connections and Conditions.* Connect the equipment as shown in figure 5-11. Do not connect the AN/USM-26 or the ME-26A/U until instructed to do so. Maintain a 6-db setting on one attenuator throughout the test.

Step	Control settings		Test procedure	Performance standard
	Test equipment	* Equipment under test		
1	<i>TS-1967/ARC-54</i> S3: 30. S4: 1. S5: 0.00. S6: RCV. S7: DIS. S8: OFF. S9: TEST. S10: RADIO. S11: TEST SET. All other switches: Any position. POWER circuit breaker: ON. <i>AN/USM-44</i> FREQUENCY RANGE: B. FREQ control: Set to 31.00 MC. MOD SELECTOR: CW. Attenuator dial: minimum attenuation. OUTPUT LEVEL: MAX. <i>Attenuators</i> Set one to 6 db. Set the other to zero. <i>ME-30B/U</i> Range selector: Set to position that gives convenient reading. Change to lower scales as necessary for nulling. <i>ME-26A/U</i> Mode SELECTOR: +. RANGE switch: 10 volts. (Use dc probe and common clip.)	<i>RT-348/ARC-54</i> TEST SWITCH: 6.	a. With AN/USM-44A control set to 31.00 megacycles. b. Tune AN/USM-44A to exact receiver frequency by tuning for minimum noise (as described in para. 5-15c). c. Increase OUTPUT LEVEL control on AN/USM-44A to maximum. d. Observe the operation of TEST METER on RT-348/ARC-54; increase attenuator settings until ME-26A/U meter reading stops increasing. Decrease attenuation slightly and record total attenuation and voltage level indicator on ME-26A/U. (Make measurement with ME-26A/U DC probe at J1203 and common clip connected to RT-348/ARC-54 chassis). e. Decrease HP-355A attenuator 6 db and vary AN/USM-44 FREQ control above and below center frequency, observing two frequencies at which voltage at J1203 is same as reference voltage recorded in d above. f. Decrease HP-355B attenuator to 60 db below attenuation recorded in d above. Again vary AN/USM-44A FREQ control above and below center frequency, noting frequencies at which voltage indicated on ME-26A/U agrees with voltage recorded in d above. g. Decrease HP-355B attenuator to 80 db below attenuation recorded in d above. Again vary AN/USM-44A FREQ control above and below center frequency, noting frequencies at which voltage indicated on ME-26A/U agrees with voltage recorded in d above. h. Repeat a through g above, with TS-1967/ARC-54 and AN/USM-44 tuned to frequencies of 50.50 and 68.95 megacycles.	a. None. b. None. c. None d. None. e. Difference between two frequencies should not be less than 30KC. f. Difference between two frequencies should not be more than 55KC. g. Difference between two frequencies should not be more than 100KC h. Same as e, f, and g above.



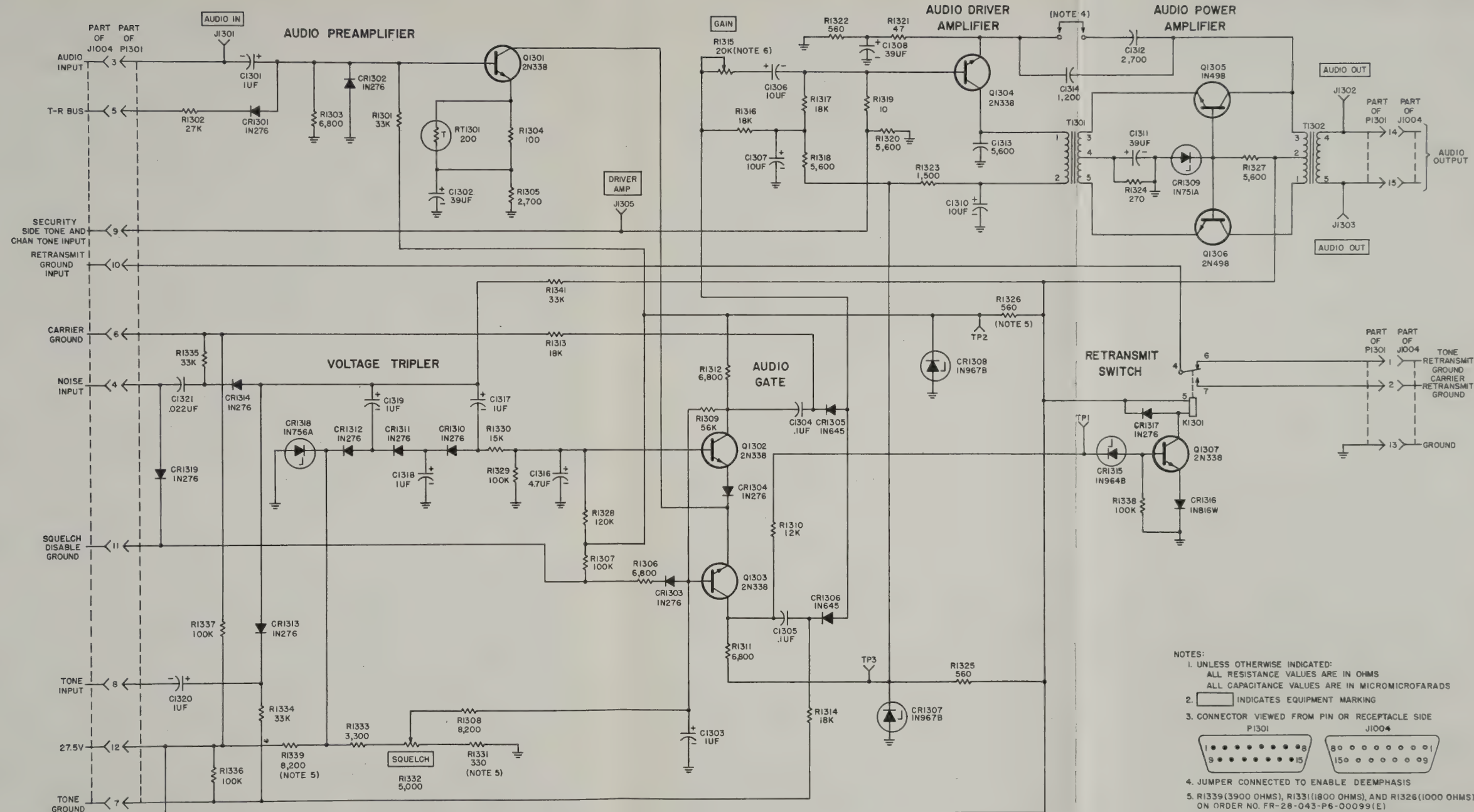
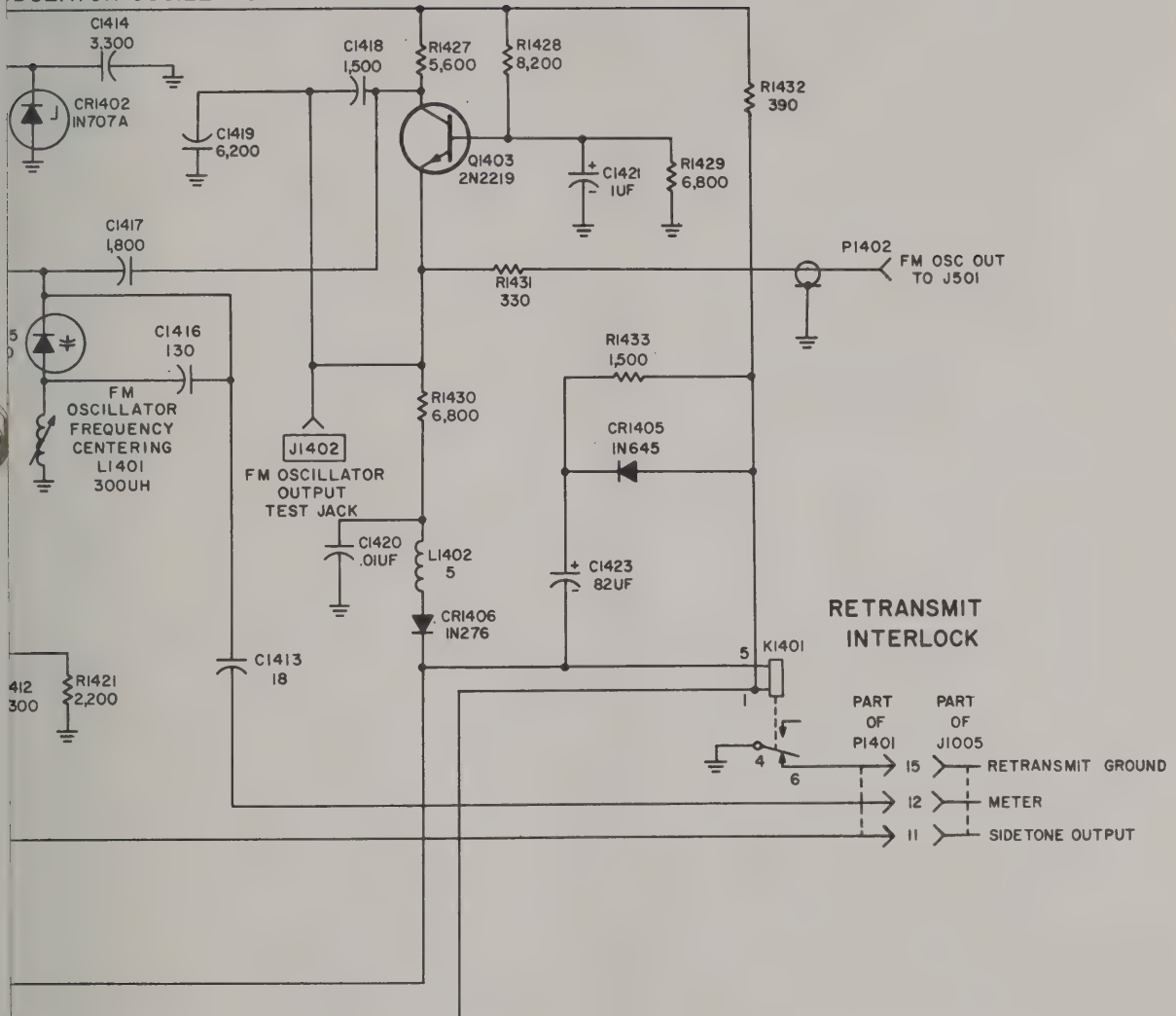


Figure 6-9. Receive Audio module, schematic diagram.

MODULATOR OSCILLATOR



TM5821-244-35- C3-171

NOTES:

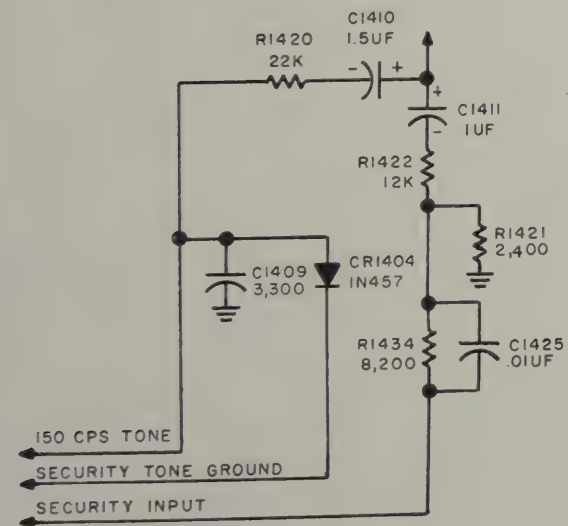
1. UNLESS OTHERWISE INDICATED:
ALL RESISTANCE VALUES ARE IN OHMS
ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS

2.  INDICATES EQUIPMENT MARKING

3. CONNECTOR VIEWED FROM PIN OR RECEPTACLE SIDE



4. JUMPER "A" ONLY CONNECTED TO ENABLE PREEMPHASIS
JUMPER "B" ONLY CONNECTED TO DISABLE PREEMPHASIS
5. RESISTOR R1417 IS 430Ω ON SETS WITH SERIAL
NUMBERS UNDER 1160.
6. CR1404 (IN276) WILL BE REPLACED BY CR1404
(IN457), WITH THE ADDITION OF CR1404 (IN477)
ON MODULES WHERE DIODES DO NOT EXIST.



MW011-5821-244-30/2
TO PROVIDE (X) MODE OPERATION.

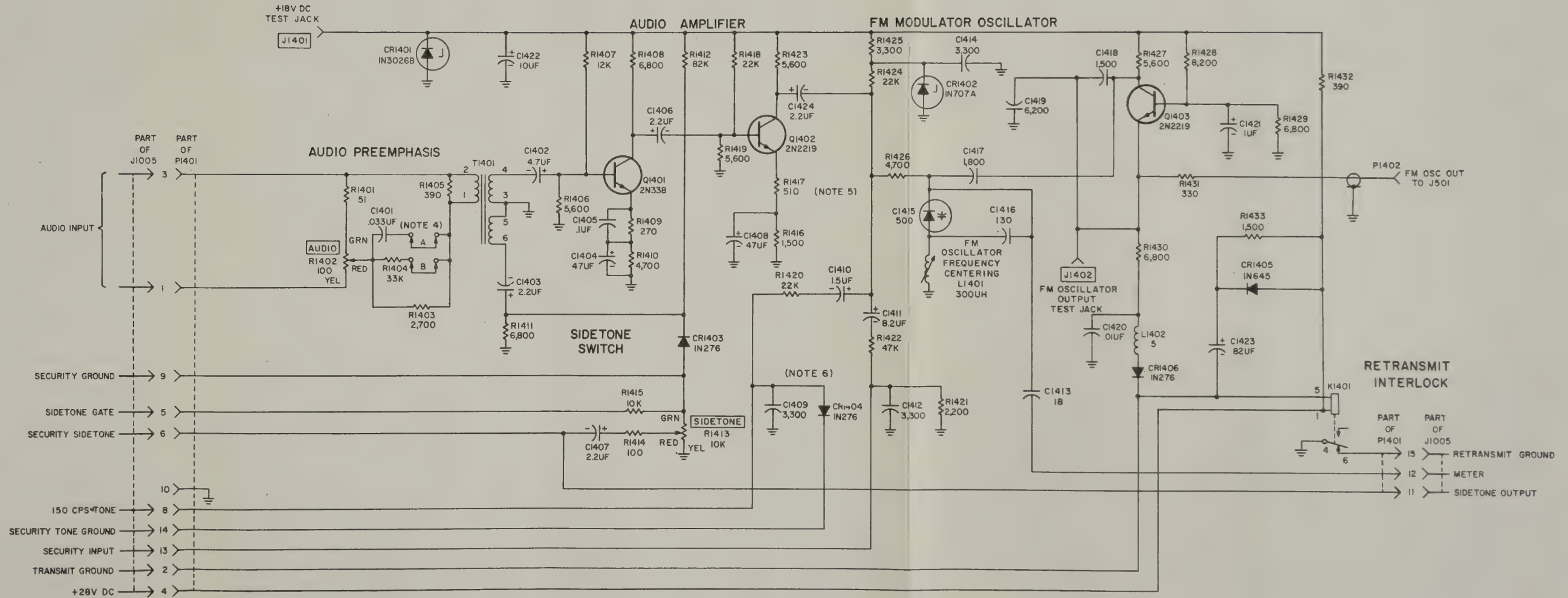


Figure 6-10. Transmit audio module, schematic diagram.

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NOTES:

1. UNLESS OTHERWISE INDICATED:
ALL RESISTANCE VALUES ARE IN OHMS
ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
 2.  INDICATES EQUIPMENT MARKING
 3. CONNECTOR VIEWED FROM PIN OR RECEPTACLE SIDE
- J1005
- PI401
4. JUMPER "A" ONLY CONNECTED TO ENABLE PREAMPHASIS
JUMPER "B" ONLY CONNECTED TO DISABLE PREAMPHASIS
 5. RESISTOR R1417 IS 430Ω ON SETS WITH SERIAL NUMBERS UNDER 1160.
 6. MODULES WITH SERIAL NUMBERS ENDING IN M AND N (HAVING DIODE CR1404 MISWIRED), MUST BE REWIRED TO CONFORM WITH CHANGE 1 OF MWO 11-5821-244-30/2.

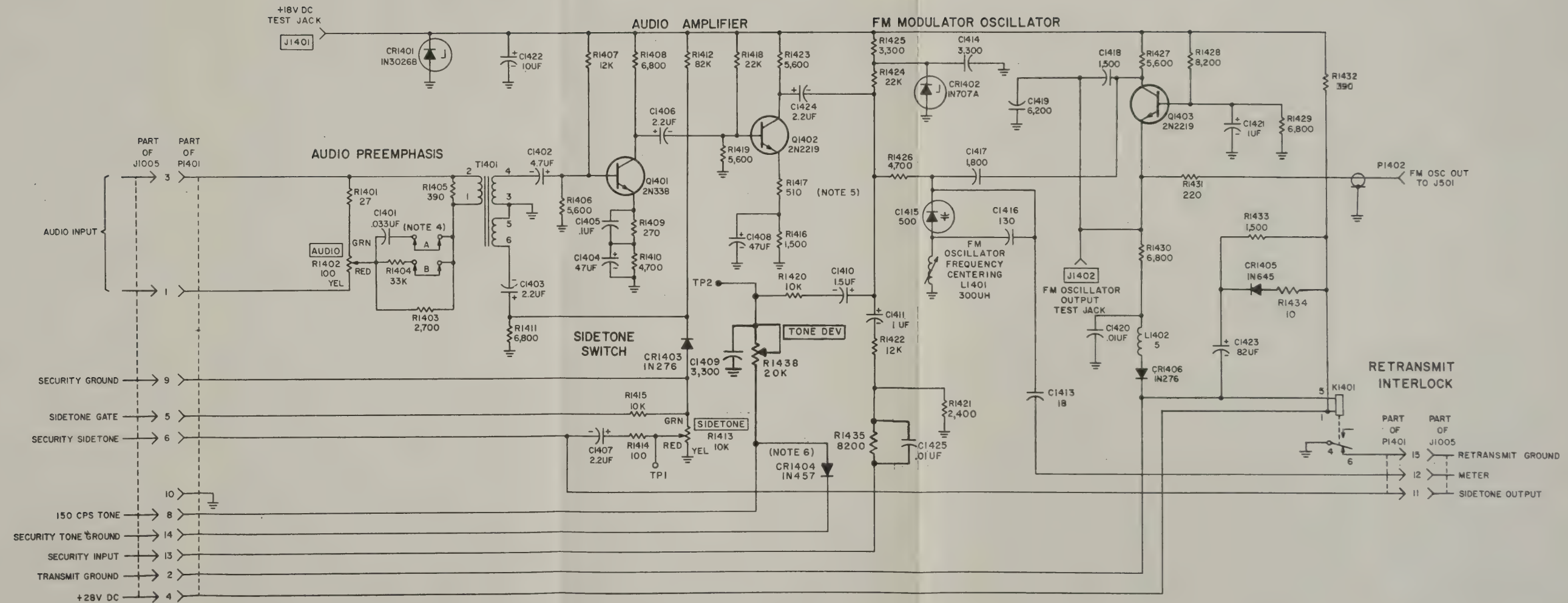
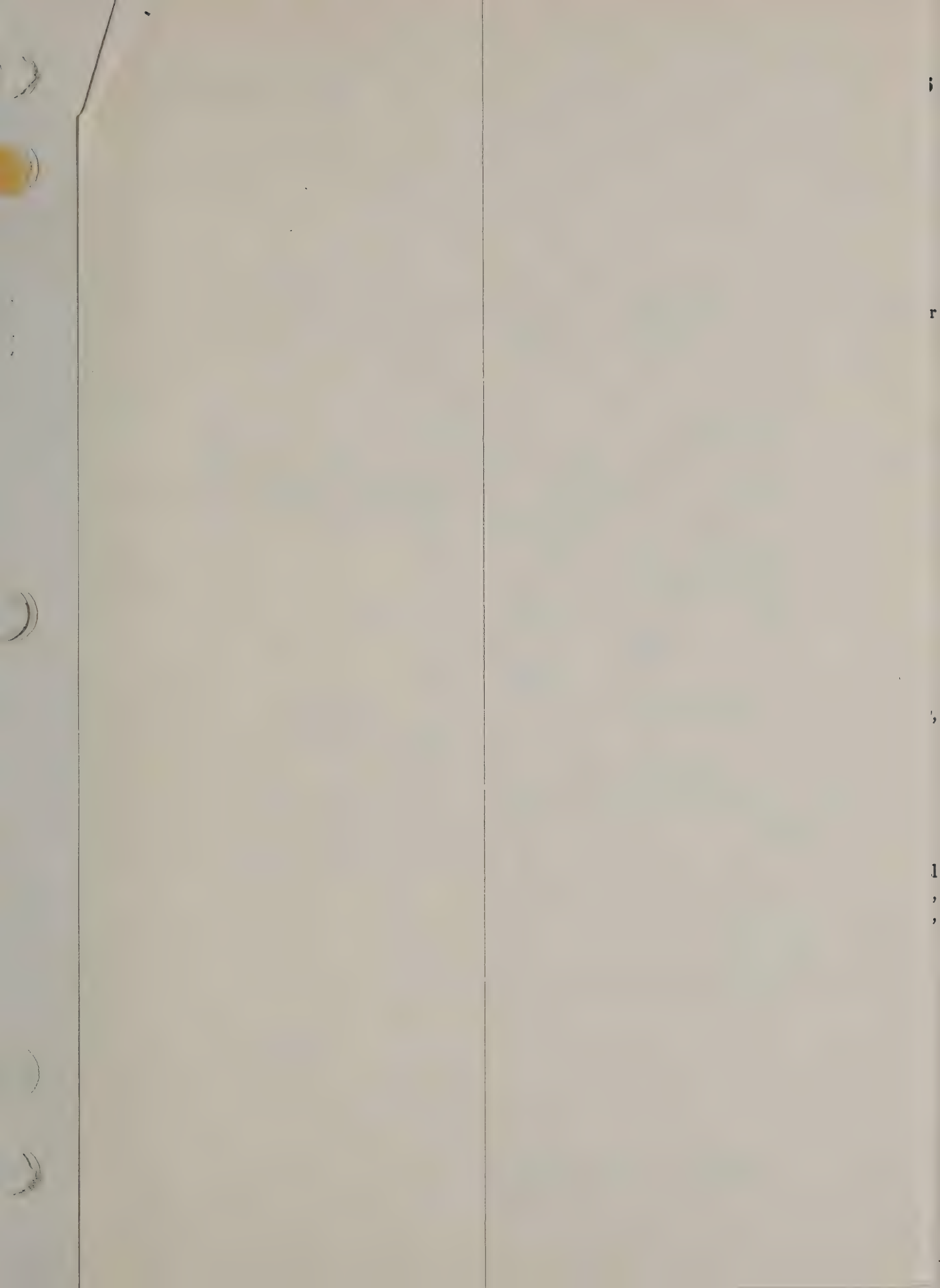


Figure 6-10.1. Transmit audio module, schematic diagram of modules with TONE DEV Potentiometer.





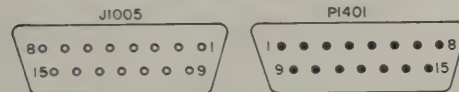


NOTES:

1. UNLESS OTHERWISE INDICATED:
ALL RESISTANCE VALUES ARE IN OHMS
ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS

2.  INDICATES EQUIPMENT MARKING

3. CONNECTOR VIEWED FROM PIN OR RECEPTACLE SIDE



4. JUMPER "A" ONLY CONNECTED TO ENABLE PREEMPHASIS
JUMPER "B" ONLY CONNECTED TO DISABLE PREEMPHASIS
5. RESISTOR R1417 IS 430Ω ON SETS WITH SERIAL NUMBERS UNDER 1160.
6. MODULES WITH SERIAL NUMBERS ENDING IN M AND N (HAVING DIODE CR1404 MISWIRED), MUST BE REWIRED TO CONFORM WITH CHANGE 1 OF MWO 11-5821-244-30/2.

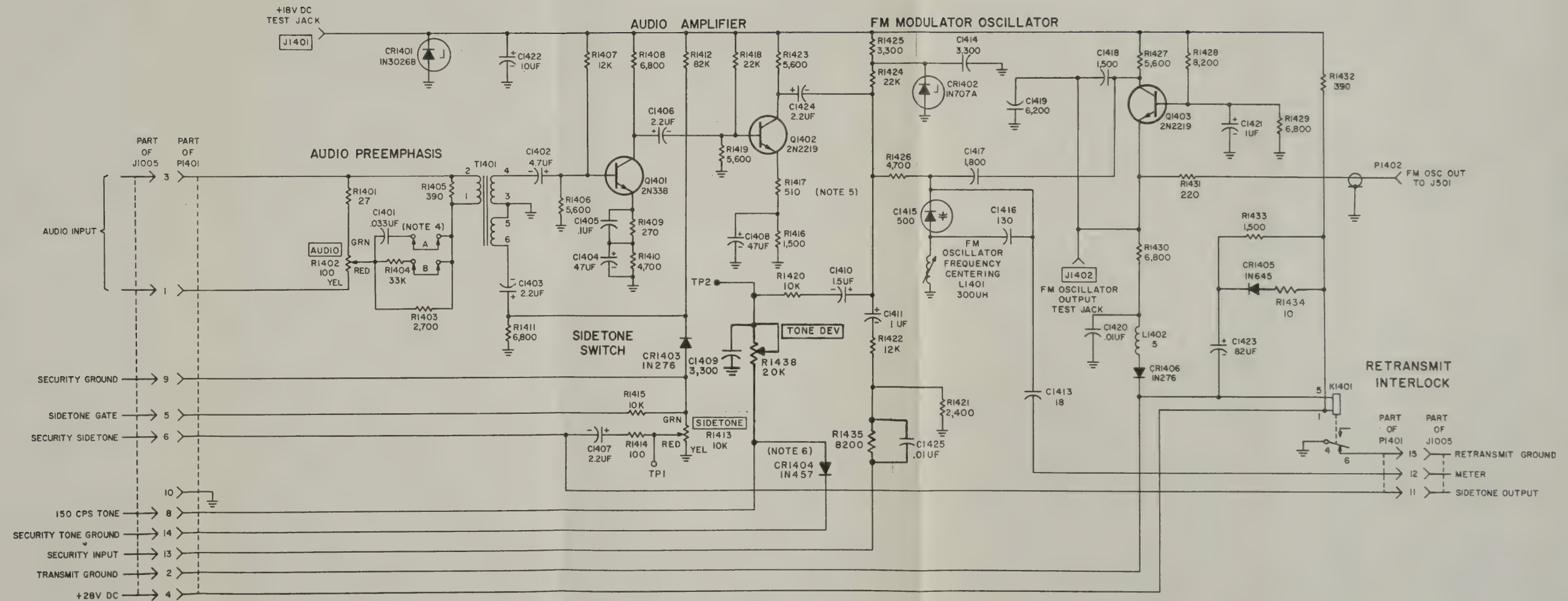


Figure 6-10.1. Transmit audio module, schematic diagram of modules with TONE DEV Potentiometer.

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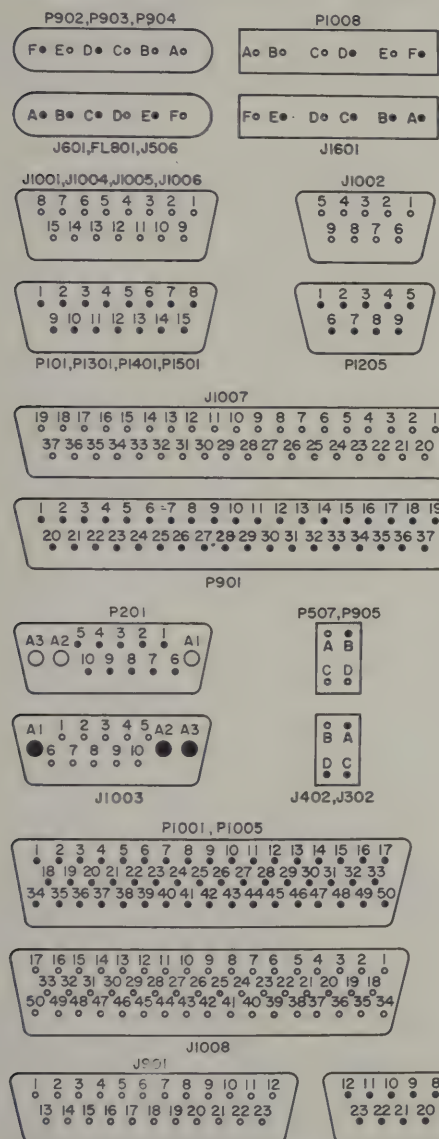
ral
A,
C,

1. UNLESS OTHERWISE INDICATED:
ALL RESISTANCE VALUES ARE IN OHMS
ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS
2. INDICATES EQUIPMENT MARKING
3. TEST SWITCH POSITIONS:
- TEST SWITCH



1. +27.5 VOLTS
 2. -27.5 VOLTS
 3. LFO OUTPUT
 4. HFO OUTPUT
 5. TONE OSC
 6. AGC
 7. FMO OUTPUT
 8. PA GRID
 9. 500V
 10. RF FWD
 11. RF REFL
 12. OFF
- X

4. CONNECTORS VIEWED FROM PIN OR RECEPTACLE SIDE



5. RI004 IS 68K ON ORDER NO. FR-28-043-P6-00099(E)

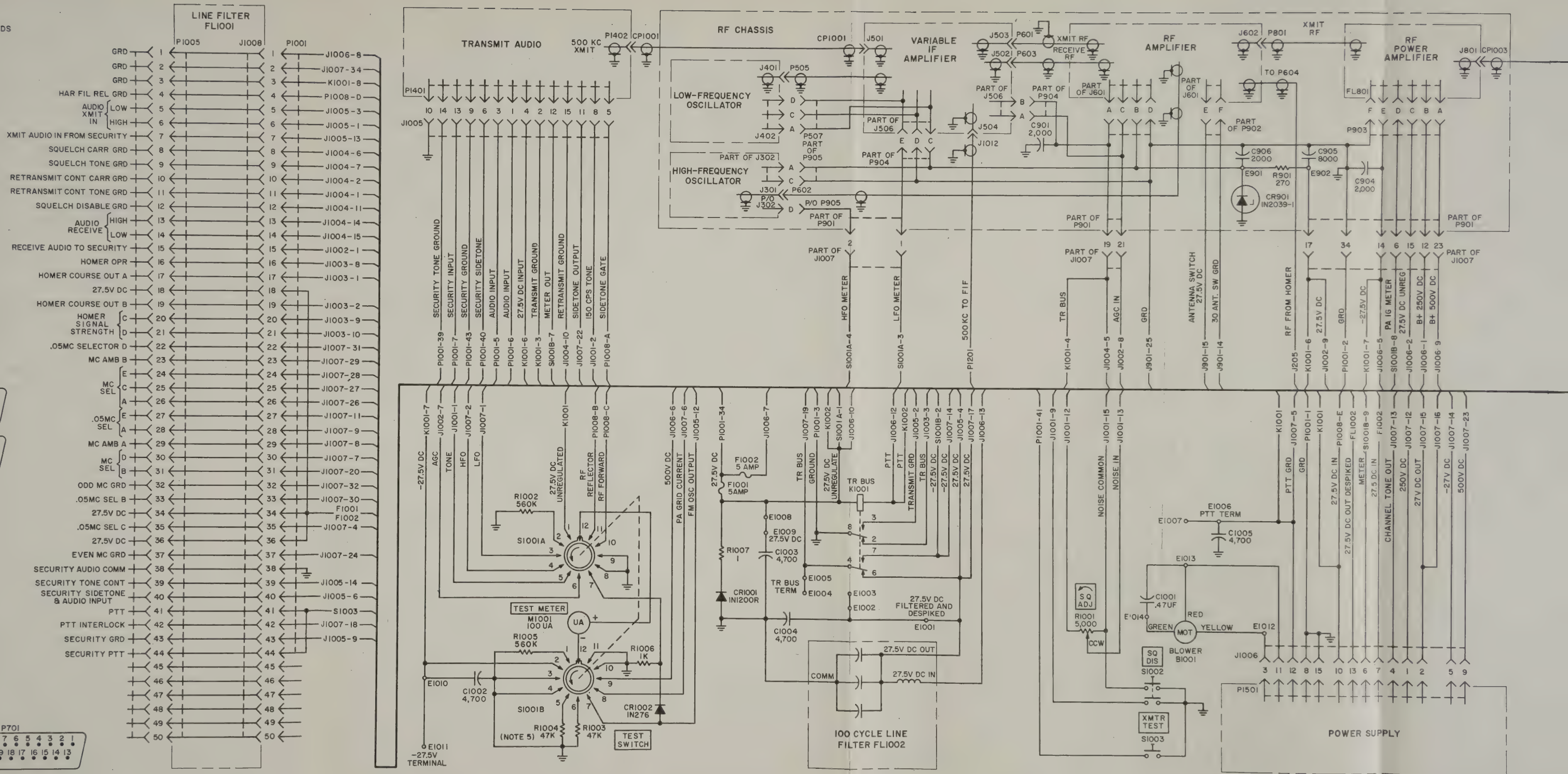


Figure 6-18. Receive-Transmitter, Radio RT-348/ARC-54, wiring diagram.



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HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 18 November 1966

**DS, GS, and Depot Maintenance Manual
RADIO SET AN/ARC-54 AND CONTROL INDICATOR C-8157/ARC**

TM 11-5821-244-35, 17 November 1965, is changed as follows:

1. This change reflects modification incorporated by MWO 11-244-30/2, and adds Control Indicator C-8157/ARC.
2. The title of this manual is changed as shown above.
3. Remove and insert pages as indicated below.

Remove pages—	Insert pages—
1-21-1-22-----	1-21-1-22
1-75-1-76-----	1-75-1-77
-----	2-41-2-42
4-60.1-----	4-60.1, 4-60.2
6-12-----	6-12
6-16-----	6-16

4. Retain this transmittal page at the front of the manual for future reference.

By Order of the Secretary of the Army:

Official:

KENNETH G. WICKHAM,
Major General, United States Army,
The Adjutant General.

HAROLD K. JOHNSON,
General, United States Army,
Chief of Staff

Distribution:

To be distributed in accordance with DA Form 12-36 (Unclass) requirements for Direct and General Support maintenance, applicable to the CV-2A, CV-2B, CV-7A, O-1E, OV-1A, OV-1B, OV-1C, U-1A, U-6A, U-8F, U-10A, CH-34C, CH-37B, CH-47A, OH-13E, OH-13G, OH-13H, OH-13S, OH-23B, OH-23C, OH-23D, OH-23F, OH-23G, UH-1B, and UH-1D aircrafts.

quencies (30.00 to 45.95 or 46 to 69.95 megacycles) while offering minimum loss to the passband frequencies. Capacitors C1627 and C1628 and inductor L1610 form a single pi-section low-pass filter to attenuate ultrahigh frequencies (uhf). Relays K1601 and K1602 are deenergized for operating frequencies from 46 to 69.95 megacycles and energized for operating frequencies from 30 to 45.95 megacycles. The switching is accomplished by the connection of pin D of the module connector to ground by the frequency selector switches at the system control box.

1-28. Sidetone Gate Rectifier

(fig. 6-13)

The sidetone gate rectifier circuit rectifies and filters a portion of the RF to provide a dc level to forward bias diode switch CR1403 in the transmit audio module. The circuit consists of diodes CR1603 and CR1604; capacitors C1610, C1620, C1621, C1622; and resistor R1607. A portion of the RF is coupled through coupling capacitor C1610 to diodes CR1603 and CR1604, where it is rectified. Inductor L1609 and capacitors C1620 and C1621 provide RF filtering. Resistor R1607 is a current-limiting resistor and capacitors C1622 and C1629 provide additional RF filtering.

1-29. Reflectometer

(fig. 6-13)

The reflectometer and associated circuit detect forward and reflected energy on the radio set transmission line. This energy is coupled to the test meter on the receiver-transmitter unit for a visual display of the transmission efficiency of the radio set and antenna system. The reflectometer consists of a directional coupler with its components (three copper strips) arranged to measure incident and reflected waves. The two outer copper strips are terminated by resistors R1601 and R1602. The center strip connects the output from the harmonic filter to the antenna. RF energy is electromagnetically coupled from the center strip to the two outer strips. For one outer strip, the inductive coupling is in phase with the capacitive coupling, and therefore adds to yield the incident wave. When the output is terminated by the proper load, no reflected waves occur since the inductive and capacitive coupling is out of phase in the other outer strip. The strip that

is terminated by resistor R1602 is terminated in the proper direction to couple incident waves, which cause current flow through diode detector CR1601 and current-limiting resistor R1604. Capacitor C1626 and resistor R1603 compensate for variations in the coupling impedance of the reflectometer at different frequencies to provide a constant value of meter current throughout the frequency spectrum for any given value of transmitted RF energy. Capacitors C1624 and C1631 provides RF filtering. Reflected RF energy causes current flow through diode detector CR1602 and current-limiting resistor R1605. Capacitors C1623 and C1630 and resistor R1606 compensate for variations in the coupling impedance of the reflectometer at different frequencies to provide a constant value of meter current throughout the frequency spectrum for any given value of reflected RF energy. Capacitor C1625 provides filtering.

1-30. Bandpass Filter FL1201

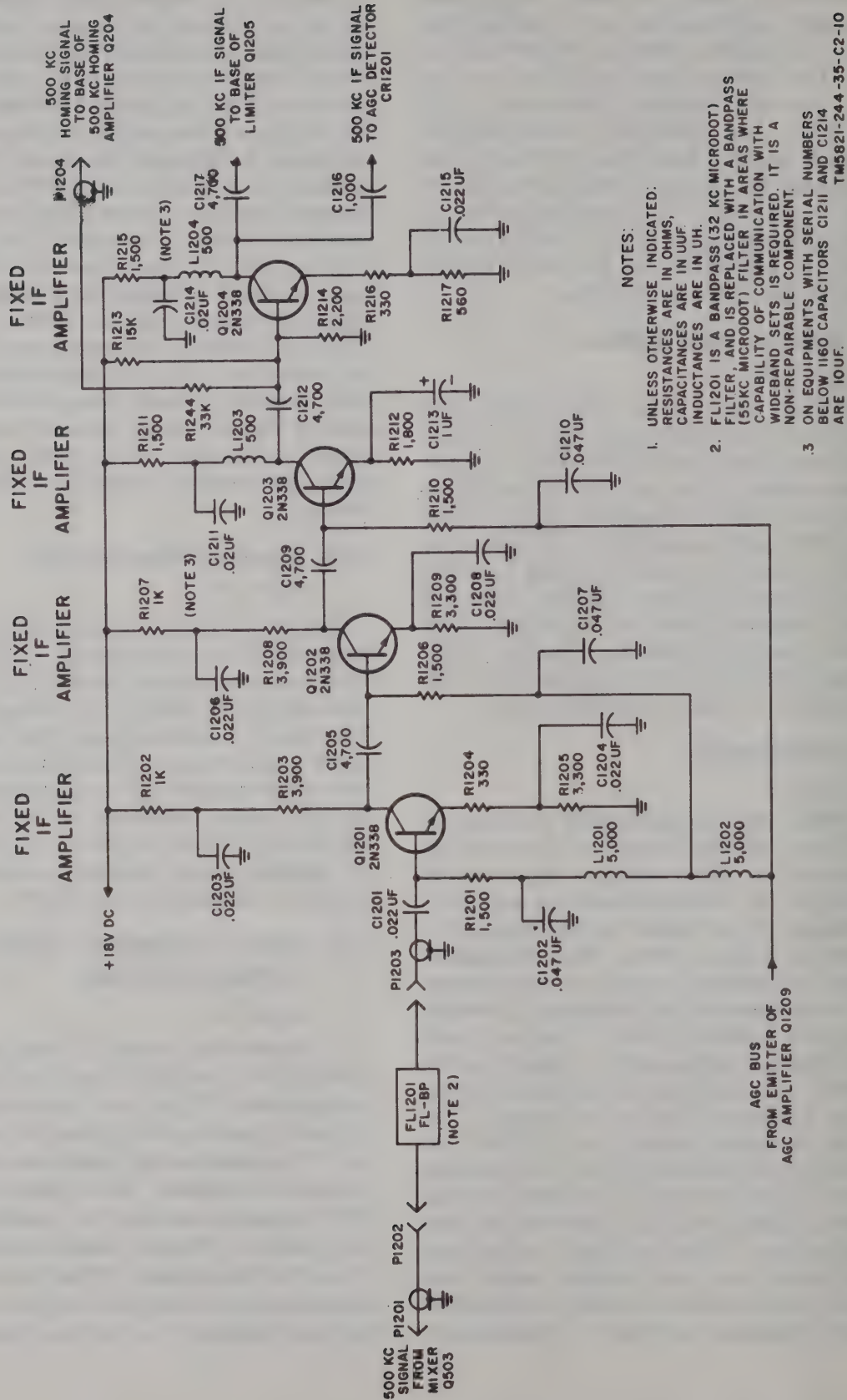
(fig. 1-10)

Bandpass filter FL1201 provides a minimum bandwidth of 30 kc between the -6-decibel (db) points and a maximum bandwidth of 100 kc between the 80-db points on the selectivity curve. This stage is a sealed ceramic filter that contains several tuned circuits. The 500-kc fixed IF signal from receiver mixer Q503 is applied to the filter through coaxial connectors P1201 and P1202. The filtered output is applied to the base of fixed IF amplifier Q1201 through coaxial connector P1203 and coupling capacitor C1201.

1-31. Fixed IF Amplifiers Q1201, Q1202, Q1203, and Q1204

(fig. 1-10)

a. Introduction. Fixed IF amplifiers Q1201, Q1202, Q1203, and Q1204 amplify the output of bandpass filter FL1201 and further attenuate unwanted frequencies that appear in the filter output. The stages are high-gain voltage amplifiers connected in cascade. Each stage consists of a NPN transistor connected in a common-emitter configuration. The age circuit regulates the gain of the first three stages. When several amplifier stages using the same power supply are tuned to the same frequency (as in these stages), oscilla-



typical matching network for low-band frequencies.

- (2) Motor B101 is part of a seeking switch circuit similar to the autopositioner circuit in the receiver-transmitter unit. When the control unit megacycle selector is switched from one frequency to another, a ground is placed on one of the control wires that comes into the antenna coupler through J101. This ground is applied, through contact 14, 15, 16, 17, or 18 of open-seeking switch S103A, to contact 12, the ground is connected to relay K101, energizing the relay, which in turn, applies power from pin J of J101 to motor B101. The motor drives all the switches, through a gear train, until the antenna coupler is tuned to the correct position. When the antenna coupler is tuned to the correct position, the ground to relay K101 is removed by S103A. Relay K101 deenergizes, removing the motor ground and shorting the motor armature, thereby stopping the motor. Diodes CR101 and CR102 prevent the grounds from being coupled back to the receiver-transmitter unit and causing the radio set to recycle. Capacitor C144 allows fast collapse of the electric field around the motor windings. Capacitor C145 allows fast collapse of the electric field around the relay winding.
- (3) The ambiguity ground at pin G or F of J101 serves the same purpose as the ambiguity ground in the receiver-transmitter unit; that is, it maintains a ground for relay K101 so that motor B101 will continue to drive through positions that would otherwise be selected by ambiguous coding information. For example, refer to the chart in paragraph 1-81 that shows control wire ground coding for the 1-megacycle shaft in the receiver-transmitter unit (the information applies to the antenna coupler as well as the receiver-transmitter unit). This chart shows that the same coding information is supplied for selection of the 60-megacycle position as for selection of the 40-megacycle position. If the radio set is

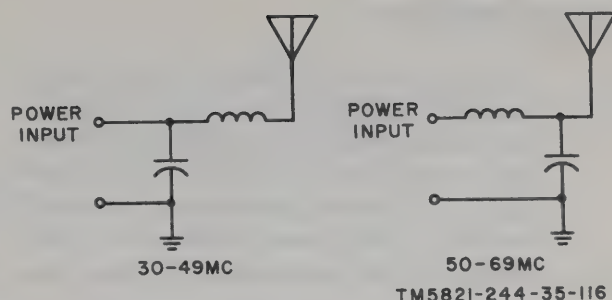


Figure 1-35. Antenna coupler matching network, simplified schematic diagram.

switched from 30 megacycles to 60 megacycles, the motor in the antenna coupler will run until it reaches the 60-megacycle position. In order for this to happen, however, the motor must run through the 40-megacycle position, which uses the same coding as the 60-megacycle position. The ambiguity switch (S102A) maintains a ground for K101 during this ambiguous-frequency crossing so that the motor will not stop at this position. When the antenna coupler reaches the 49-megacycle position, the ambiguity ground is removed by S102A, allowing the motor to stop on the next position that provides the proper code (open circuit). That position will be 60 megacycles. The function of the open-seeking switching system is described in detail in paragraph 1-82c, which describes an identical circuit in the receiver-transmitter.

- (4) For frequency settings of 30.00 to 49.95 megacycles, switch S101A selects the capacitance and S101B selects the inductance to provide the proper impedance matching between the antenna and the receiver-transmitter unit. Capacitance is selected by the connection of one or more of capacitors C120 through C143. Inductance is selected by the connection of one of inductors L121 through L145. The equivalent circuit for any of these selections is shown in figure 1-35. All circuits used in this frequency range (30.00 to 49.95 megacycles) are of the capacitive input configuration. For frequency settings of 50.00 to 69.95 mega-

cycles, switch S103B selects the capacitance and S103C selects the inductance to provide the proper impedance matching between the antenna and the receiver-transmitter unit. Capacitance is selected by the connection of one or more of capacitors C101 through C119. Inductance is selected by

the connection of one of inductors L101 through L120. The equivalent circuit for any of these selections is shown in figure 1-35. All circuits in this frequency range (50.00 to 69.95 megacycles) are of the inductive input configuration.

Section X. FUNCTIONING OF CONTROL INDICATOR C-8157/ARC

Note. Control Indicator C-8157/ARC is used with, but not part of, Radio Set AN/ARC-54.

1-97. General

This section contains detailed description of circuits that comprise Control Indicator C-8157/ARC.

a. The control indicator will be installed in aircraft whenever TSEC/KY-28 is installed, and is used to control the output of Radio Set AN/ARC-54 (or equivalent) as to the mode of operation.

b. Whenever the C-8157/ARC is installed, the output of the radio set will be controlled by Control Indicator C-8157/ARC in either plain or ciphony mode.

Note. MWO 11-5821-244-30/2, 12 September 1966, must be applied to Radio Set AN/ARC-54 when used with the TSEC/KY-28 and C-8157/ARC for (X) mode operation.

1-98. Power Control CB1

(fig. 1-36)

The power control (CB1) is a circuit breaker which doubles as a POWER ON switch. Circuit breaker CB1 applies +28 volts dc to the control indicator. The +28 volts is supplied from the aircraft +28-volt dc bus through the aircraft harness, connector P1, and pin A of J1. The +28 volts dc through CB1 is applied to pin 2 of PLAIN-CIPHER switch SW1 to POWER ON indicator L1 to ZEROIZE switch SW3 and pin B of J1. Pins E and F of J1 connect from the ground bus of aircraft and are tied to ground along with ground return to TSEC/KY-28. Pin D of J1 connects from system ground to ground, REG-RE-X, Switch SW2 and pin 2 of PLAIN-CIPHER switch.

Notes:

1. Circuit breaker CB1 must be in the ON position to have any output from associated radio equipment.
2. External wiring is not part of Control Indicator C-8157/ARC.

1-99. ZEROIZE Switch SW3

(fig. 1-36)

The ZEROIZE switch (SW3) is a two-position

locking toggle, under a spring-loaded cover, and is normally in the OFF position. Switch SW3 will be placed in the ON position only during emergency situations. When SW3 is placed in the ON position, +28 volts dc is applied to the TSEC/KY-28 through pin C of J1 and P1 and the aircraft harness wiring.

1-100. PLAIN-CIPHER Switch SW1

(fig. 1-36)

Switch SW1 is used to supply either plain or cipher mode of operation, and is a double-throw, double-pole switch.

a. *Plain Mode.* With switch SW1 in the PLAIN position, pins 1 and 2 of SW1 make contact, causing the red lamp (L2) to light and applies +28 volts dc potential to the receive plain-cipher control of the TSEC/KY-28 through contact J of P1 and J1.

b. *Cipher Mode.* With switch SW1 in the CIPHER position, pins 2 and 3 of SW1 make contact, causing the green lamp (L3) and remote cipher lamp (if used) to light, and applies a ground potential (contacts 3 through 1) to receive plain-cipher control through contact J of P1 and J1.

1-101. REG-RE-X Switch SW2

(fig. 1-36)

Switch SW2 is a two-position locking toggle switch and is used whenever retransmission is necessary. Switch SW2 is normally in the REG position, which allows either cipher or plain communications.

a. *RE-X Position.* When switch SW2 is in the RE-X (closed) position, a ground potential is applied to the KY-28 for extended range, through pin K of J1, P1, and the aircraft's interconnecting harness.

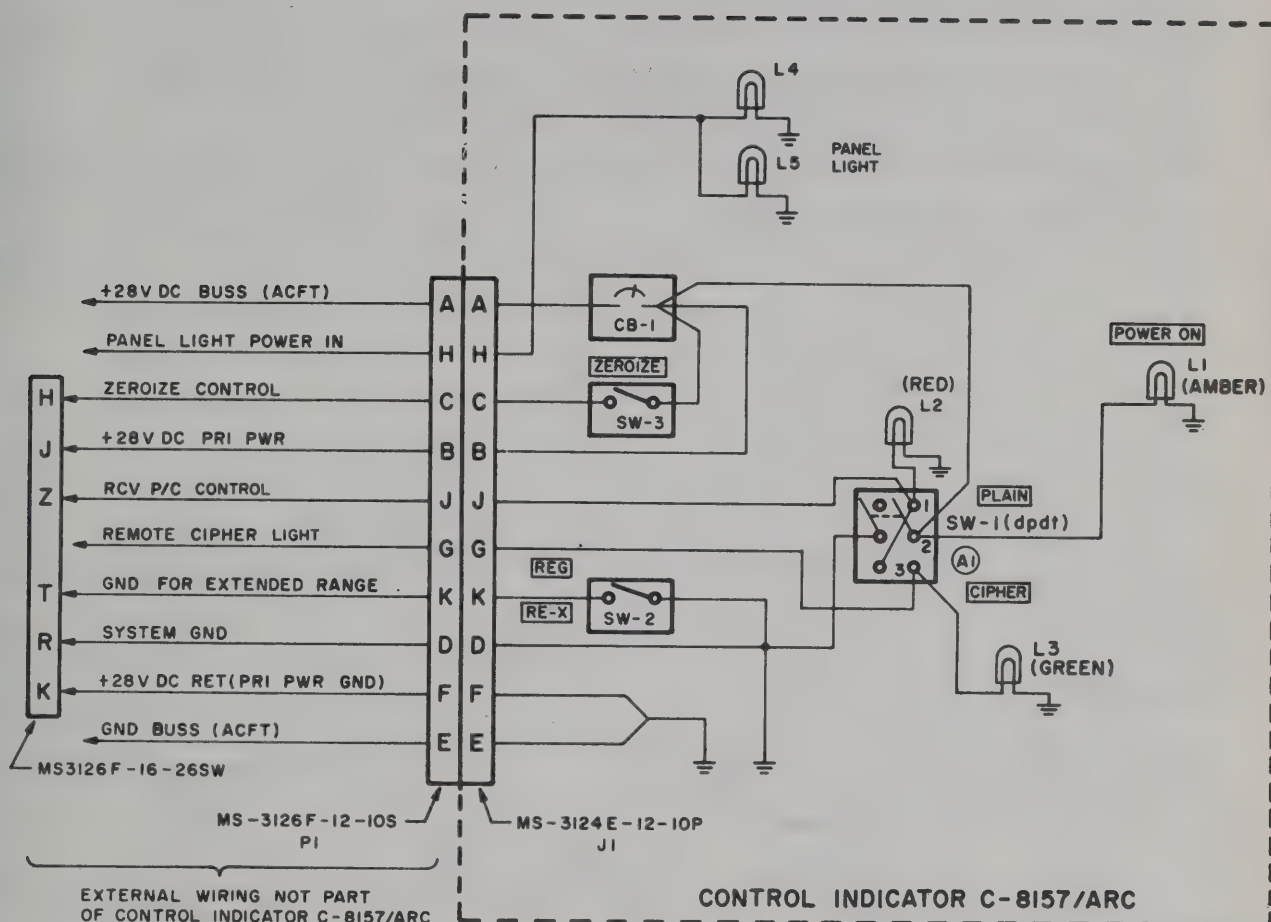
b. *REG Position.* In this position of switch SW2 (REG), the ground potential supplied to the KY-28 is removed.

1-102. Panel Lights

(fig. 1-36)

The two panel lamps, L4 and L5, are used to edgelight the front control panel, and receive their

power from the aircraft through pin H of J1 and P1. Panel lamps are normally controlled along with the aircraft panel lamps.



NOTE: WIRING IN ACCORDANCE WITH
SPEC MIL-E-5400

TM 5821-244-35-C2-3

Figure 1-36. Control Indicator C-8157/ARC, schematic diagram.

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Section V. CONTROL INDICATOR C-8157/ARC TROUBLESHOOTING

2-18. General

a. Control Indicator C-8157/ARC must be removed from the aircraft if it fails in any of its operations during organizational maintenance, or at anytime it proves to be faulty.

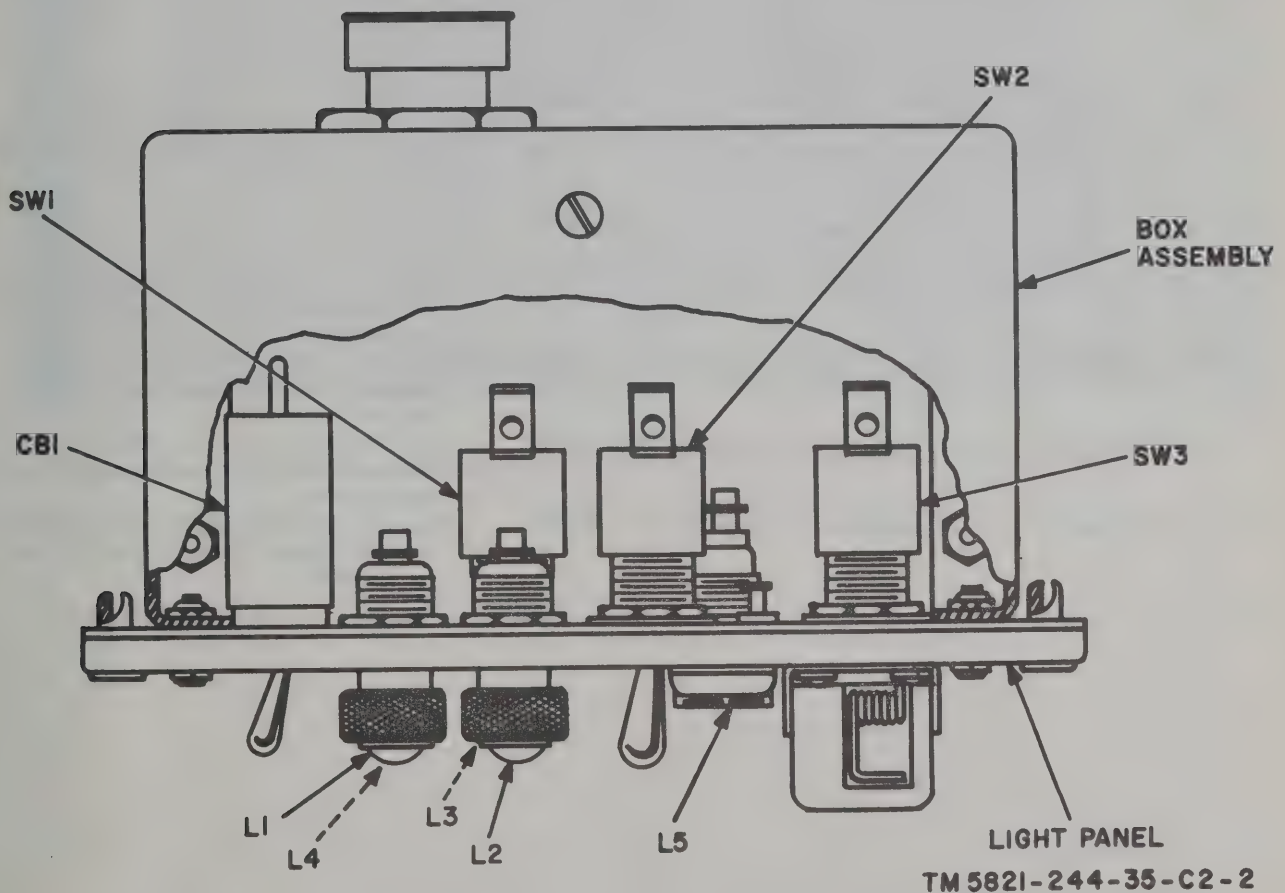
b. When it has been removed for bench testing, and the exact functional failure is known (as indicated prior to removal), use a multimeter, the schematic diagram (fig. 1-36), and the troubleshooting chart (para 2-19) to isolate the fault. Refer to figure 2-15 for parts identification.

c. With an ohmmeter, perform the procedures in paragraph 2-19.

2-19. Troubleshooting Chart

The following chart lists the control unit troubles by symptoms, suggest probable causes of each trouble, and suggests a logical procedure for isolating each trouble. The trouble symptoms are grouped into distinct classes of troubles such as retransmission, ciphony, and zeroize. The only test equipment needed for troubleshooting is a multimeter. Refer to the control unit schematic diagram (fig. 1-36) and parts location diagram (fig. 2-15).

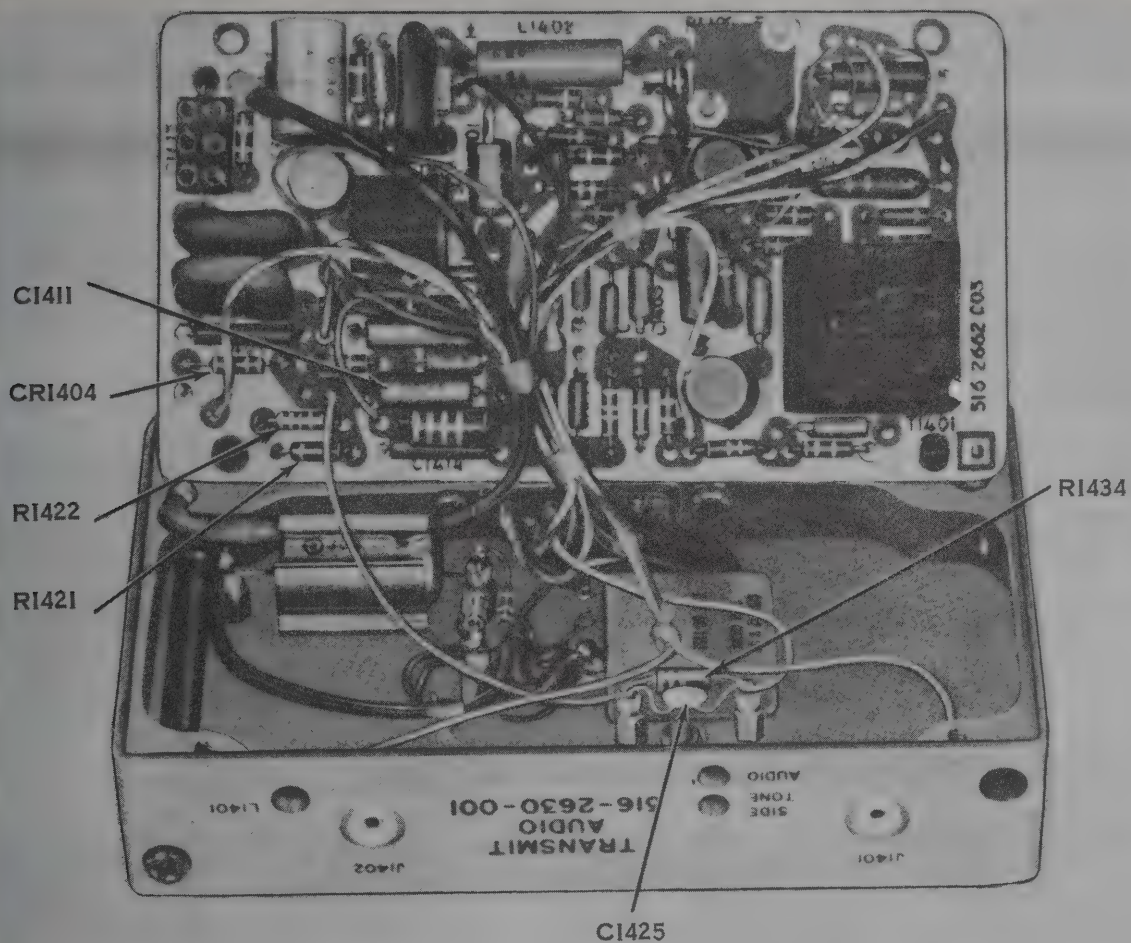
Note. All continuity checks are made with CB1 in the ON position.



TM 5821-244-35-C2-2

Figure 2-15. Control Indicator C-8157/ARC, parts location.

Item	Indication	Probable trouble	Procedure
REG—RE—X			
1	RE—X line open-----	Switch SW2, or wiring from switch to pin K of J1, or poor GND connection.	Check for continuity between D and K of connector J1, and GND and K of J1.
2	REG line shorted-----	Switch SW2-----	Check for continuity between D and K of connector J1. Reading should be infinite with switch open.
PLAIN—CIPHER			
3	PLAIN line open-----	Switch SW1, or wiring from switch to pin J of J1 and wiring from CB1 to pin 2 of SW1.	Check for continuity between pin 1 and pin 2 of SW1, also pin 1 and J of J1, and also pin 2 of SW1 and A of J1.
4	CIPHER line open-----	Switch SW1, or wiring from 3 of SW1 to G of J1, or pin 2 of SW1 to CB1, or pin 1 to J of J1.	Check for continuity between pin 2 and 3 of SW1; between pin 3 and G of J1; between pin 2 and A of J1, and pin 1 and J of J1.
ZEROIZE			
5	ZEROIZE line open-----	Switch SW3, or wiring to CB1, or C of J1--	Check for continuity across SW3; between SW3 and A of J1; between SW3 and C of J1.
POWER CIRCUITS			
6	CB1 line open-----	Circuit breaker CB1 or wiring to A of J1---	Check for continuity across CB1 (in ON position); between CB1 and A of J1.
7	+28 volt primary power line open.	Wiring from CB1 to B of J1 and item 6 above.	Check for continuity between CB1 and B of J1 and A of J1.
LAMPS AND INDICATORS			
8	Panel lamps do not light--	Lamps L4 and L5, or wiring from H of J1--	Check for continuity across lamps (approximately 3 ohms); between L4 and L5 and H of J1.
9	Red lamp (L2)-----	Lamp L2, or wiring from pin 1 of SW1-----	Check for continuity across lamp (approximately 3 ohms) between pin 1 of SW1 and lamp.
10	Green lamp (L3)-----	Lamp L3, or wiring from pin 3 of SW1-----	Check for continuity across lamp (approximately 3 ohms) between lamp L3 and pin 3 of SW1.
11	Amber lamp (L1)-----	Lamp L1, or wiring from pin 2 of SW1-----	Check for continuity across lamp (approximately 3 ohms) between lamp L1 and pin 2 of SW1.



TM 5821-244-35-C2-189

Figure 4-80.1. Transmit audio module showing (X) mode modification (with diode located on board), parts identification.

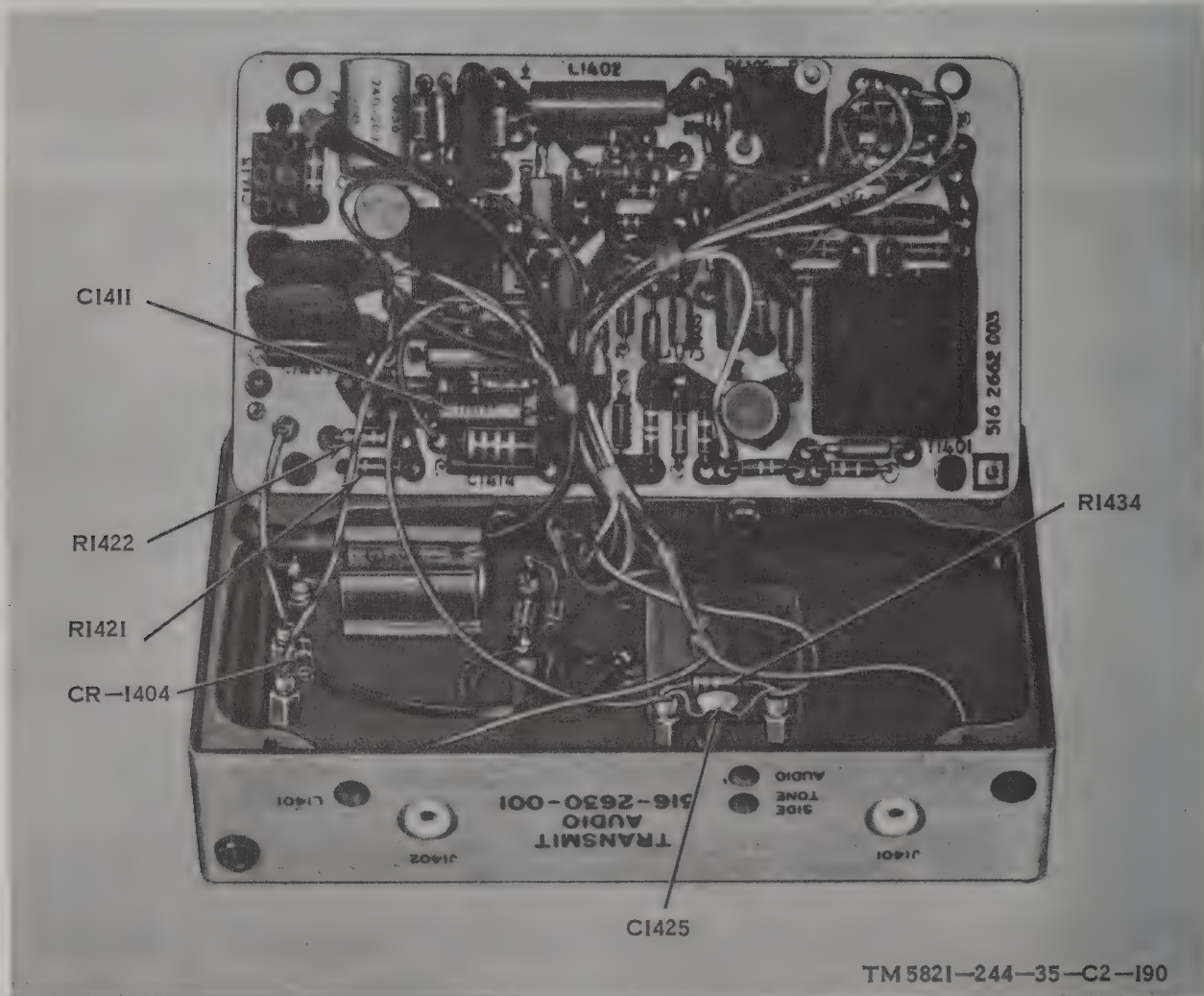
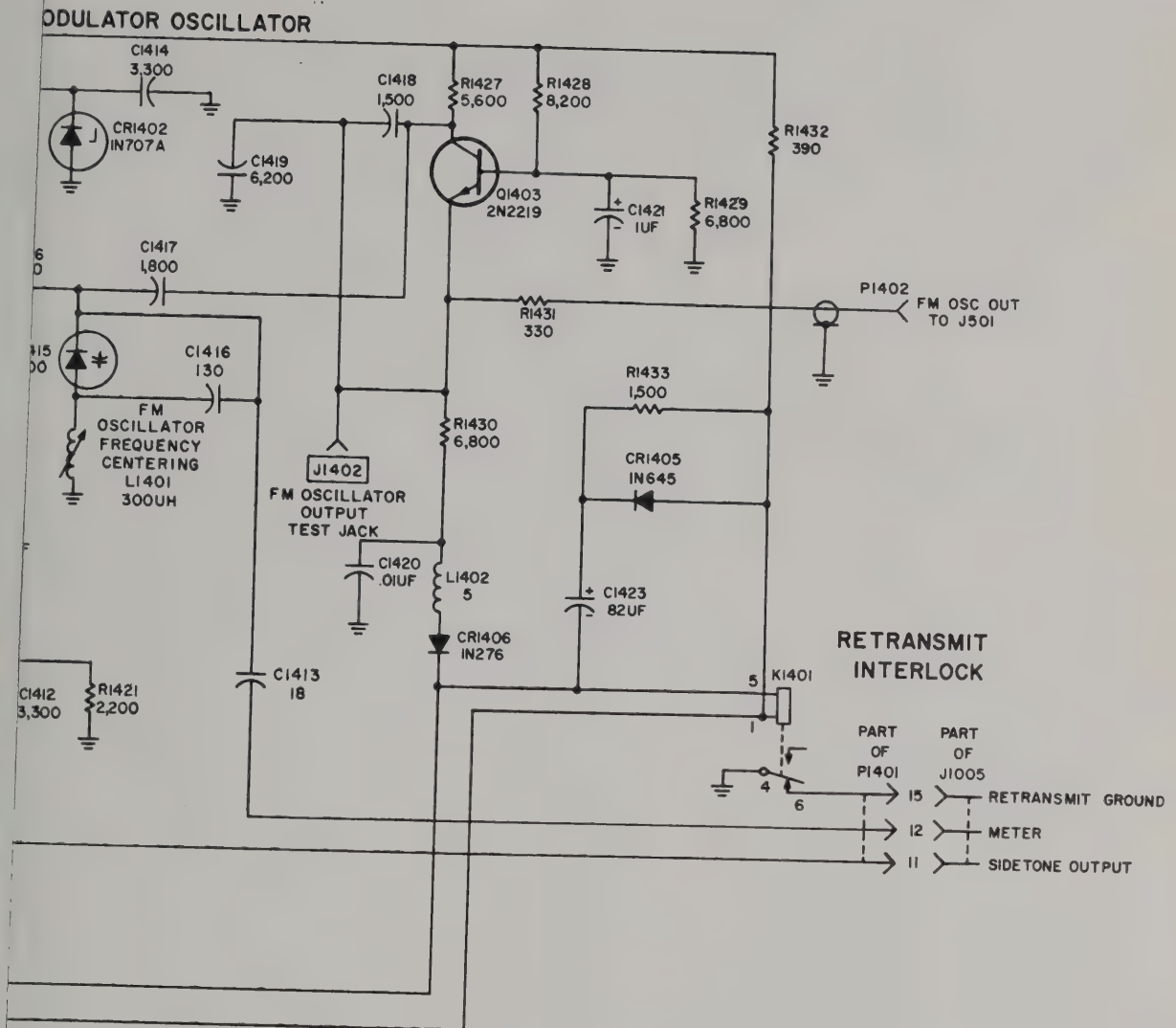


Figure 4-30.2. Transmit audio module showing (X) mode modification (with diode located on side plate), parts identification.



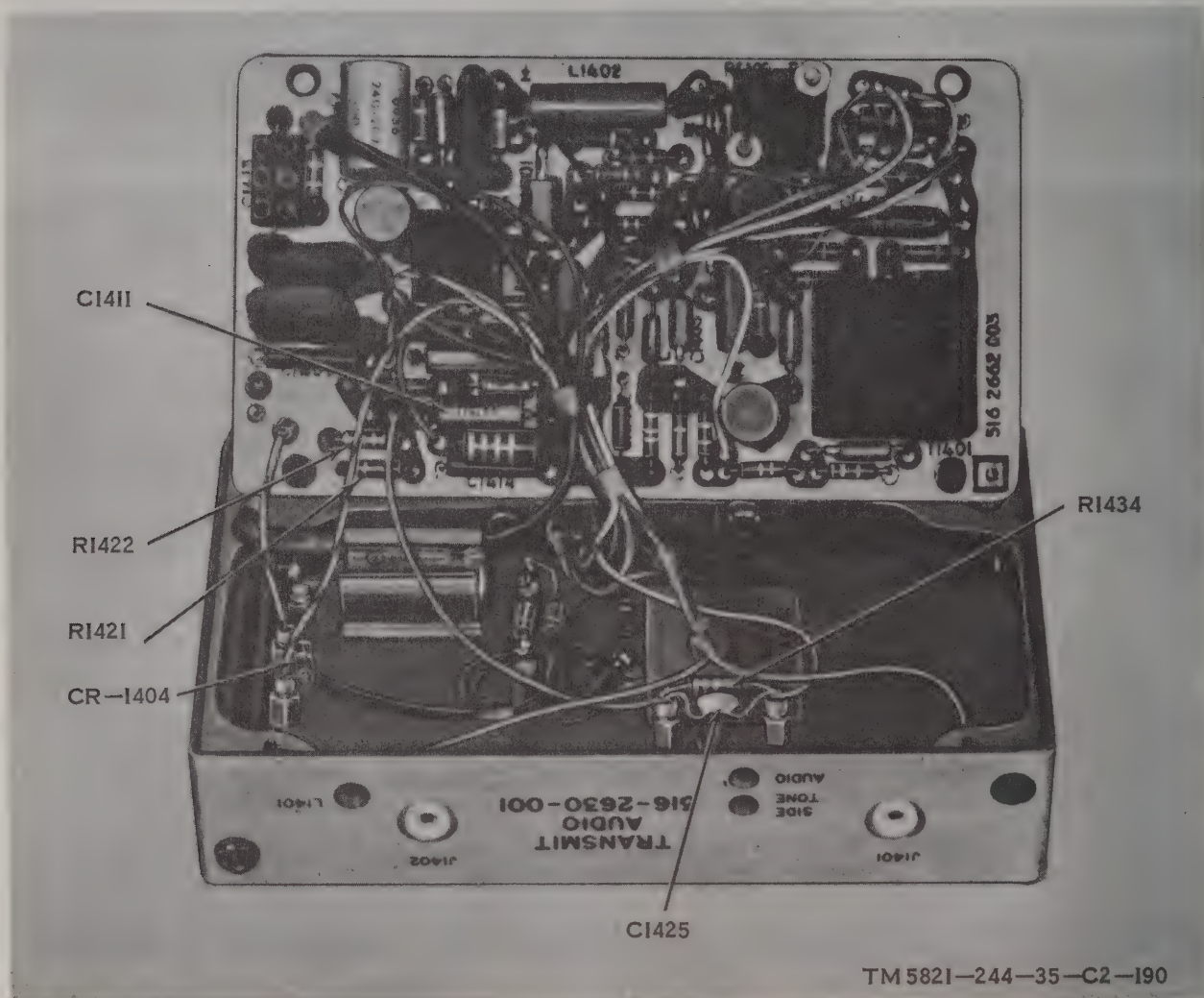


Figure 4-30.2. Transmit audio module showing (X) mode modification (with diode located on side plate), parts identification.

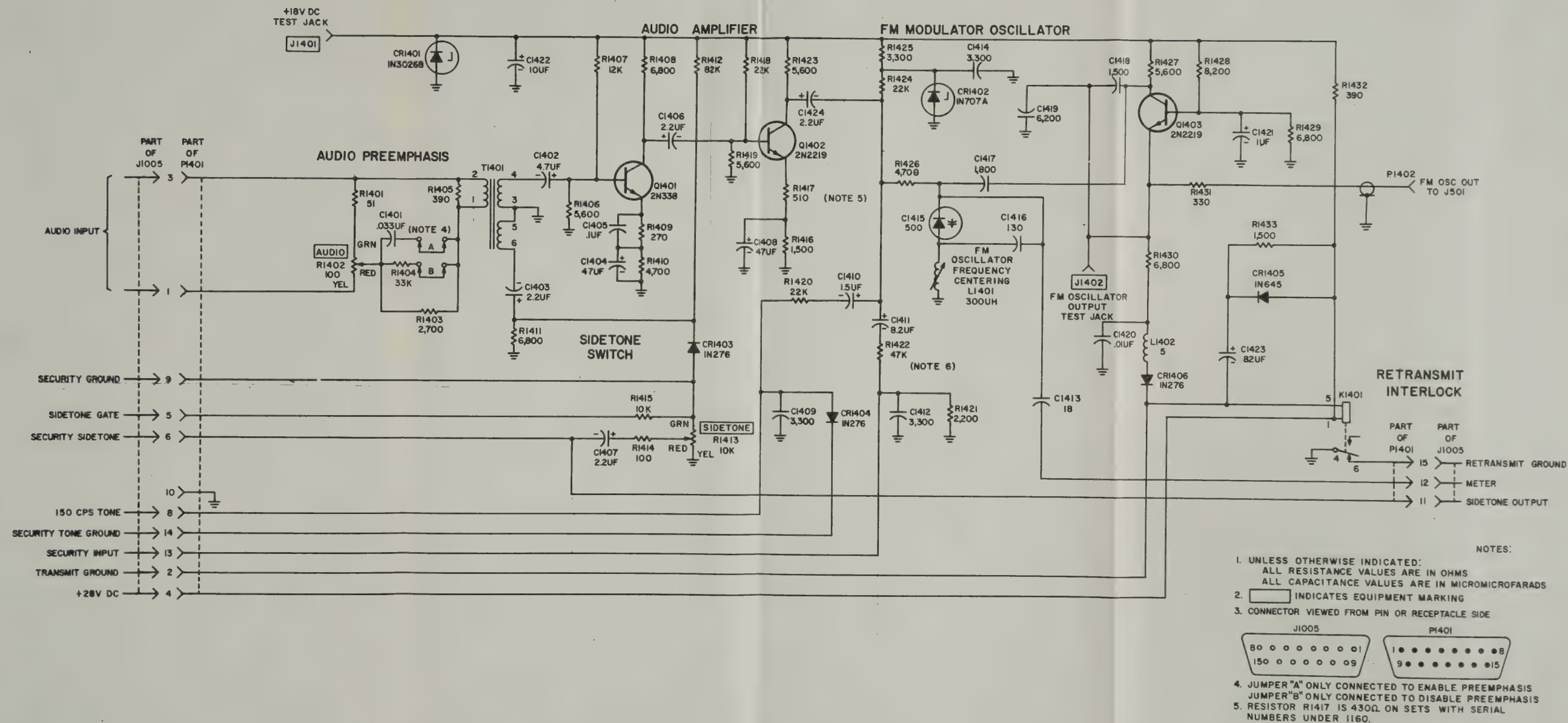
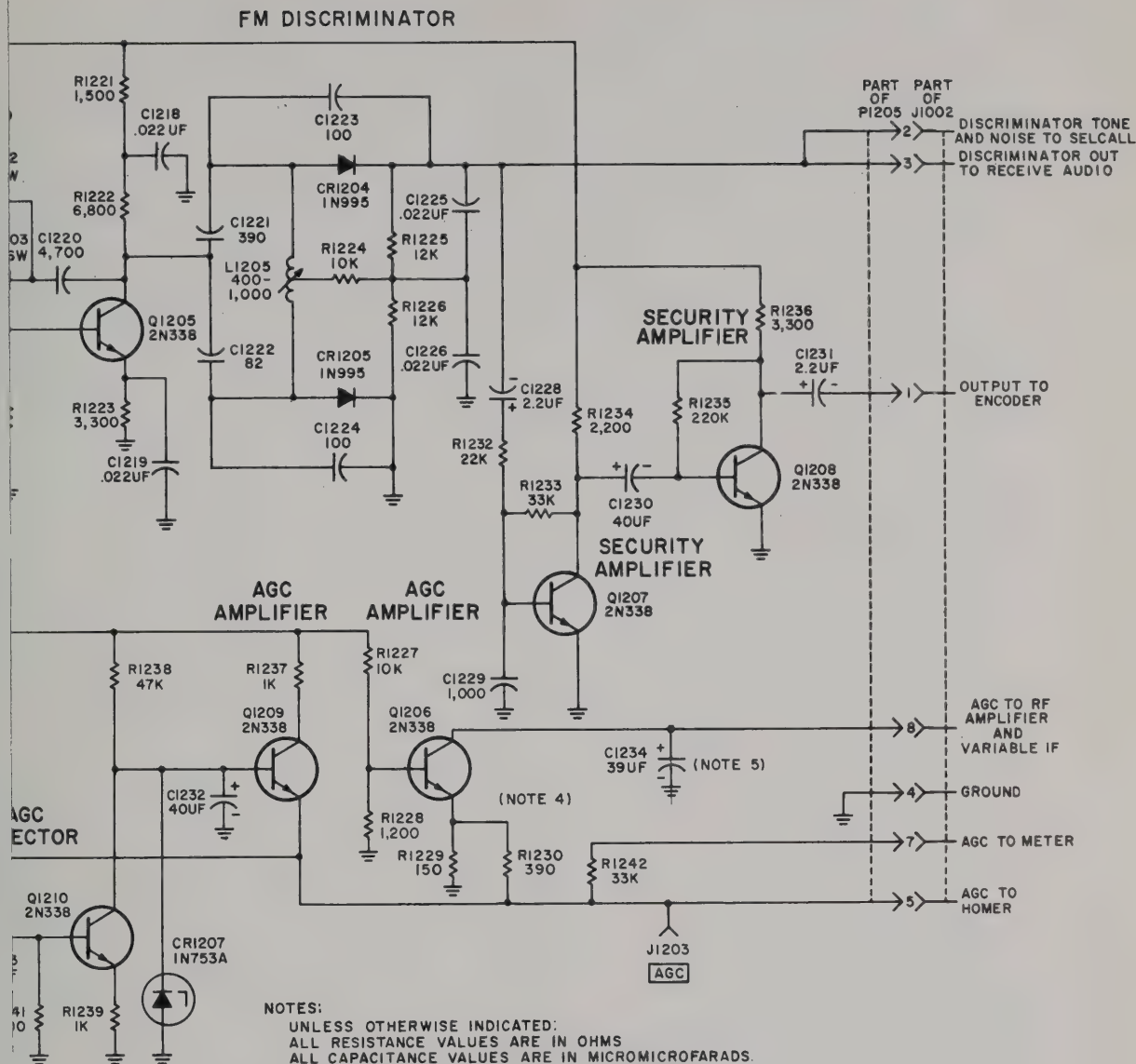


Figure 6-10. Transmit audio module, schematic diagram.

TM5821-244-35-C1-171



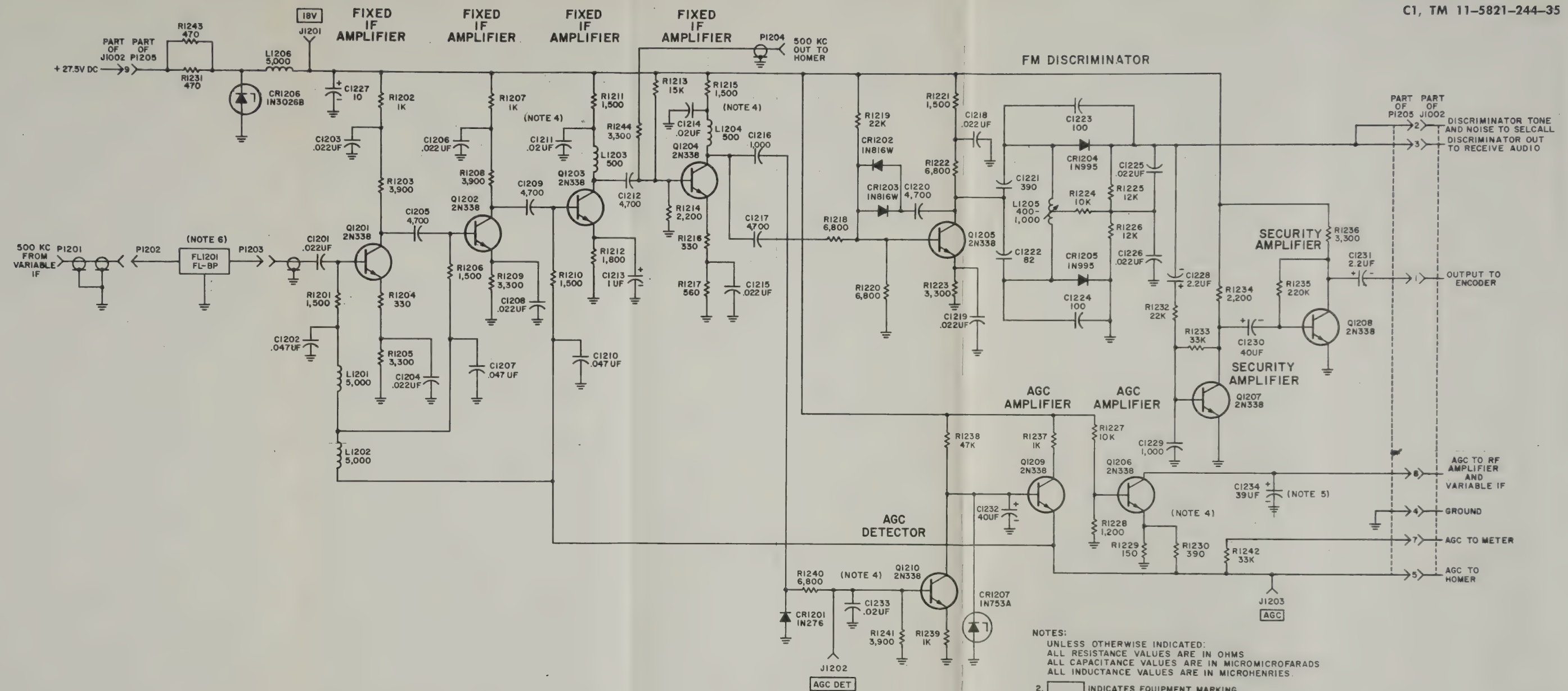


Figure 6-14. Fixed IF module, schematic diagram.

CHANGE

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DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 23 August 1966

No. 1

DS, GS, and Depot Maintenance Manual

RADIO SET AN/ARC-54

TM 11-5821-244-35, 17 November 1965, is changed to reflect modifications incorporated by MWO 11-5821-244-40/1 and MWO 11-5821-244-30/2.

1. Remove and insert pages as indicated below.

Remove pages	Insert pages
1-9, 1-10 -----	1-9, 1-10
4-47, 4-48 -----	4-47, 4-48
None -----	4-60.1
4-71, 4-72 -----	4-71, 4-72
6-12 -----	6-12
6-14 -----	6-14
6-16 -----	6-16

2. Retain this transmittal page at the front of the manual for future reference.

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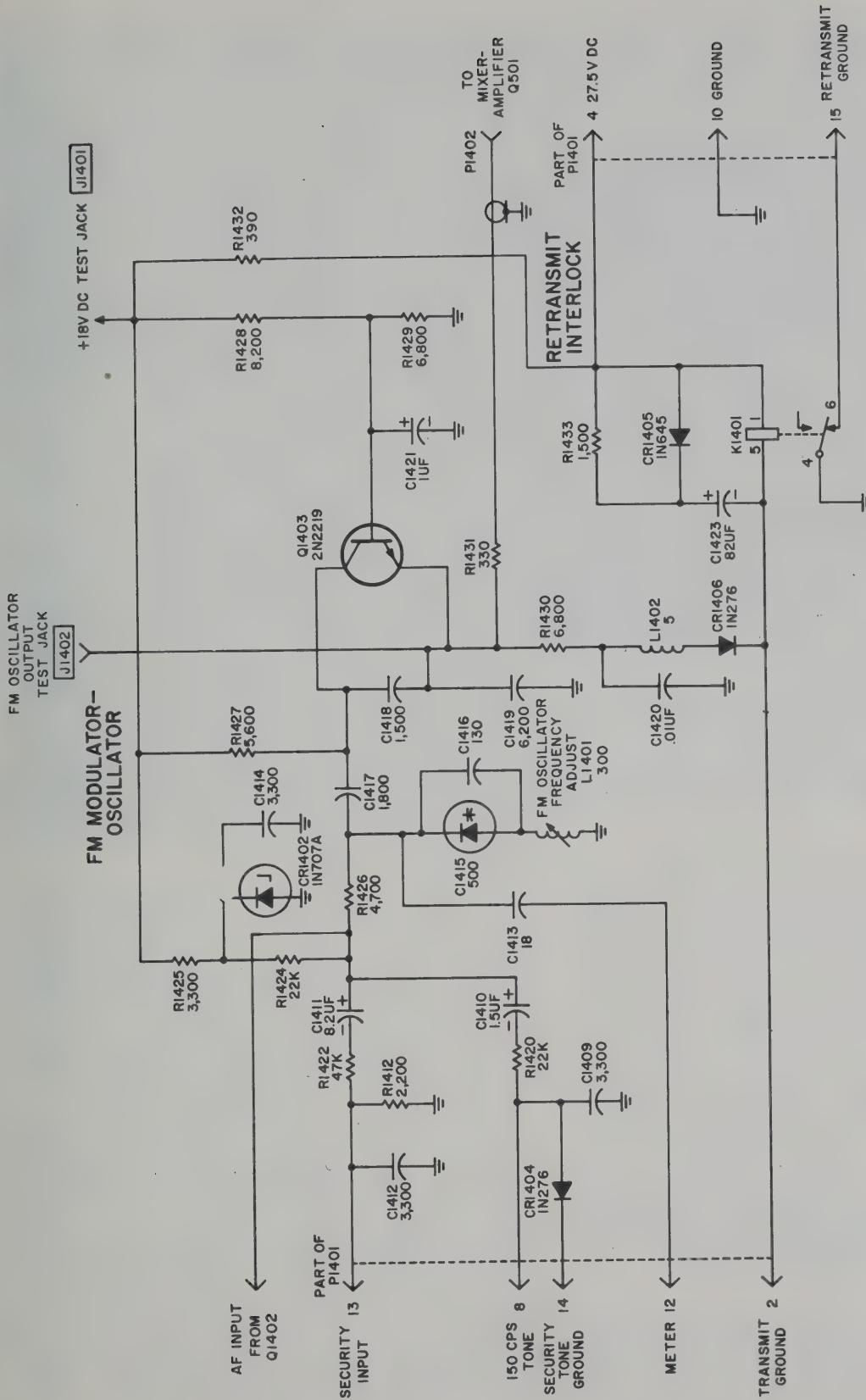
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TM5821-244-35-5

Figure 1-3. Fm modulator-oscillator and retransmit interlock circuits, schematic diagram.

and Zener diode CR1402. Capacitor C1414 filters the bias supply. Variable capacitor C1415 is part of a tank circuit, which is resonant at 500 kc. The tank circuit consists of capacitors C1415 through C1419 and variable inductor L1401. Inductor L1401 adjusts the center frequency of the tank to 500 kc. Transistor Q1403 provides the gain for the oscillator. Feedback is through capacitor C1418. Resistor R1427 is the collector-load resistor for Q1403. Base bias for Q1403 is supplied through the voltage divider comprising resistors R1428 and R1429. Capacitor C1421 is a filter capacitor. The oscillator is turned on by the transmit ground at pin of P1401. The transmit ground, applied when the transmit button is depressed, provides a conduction path for Q1403 through diode CR1406, inductor L1402, and emitter-biasing resistor R1430. Inductor L1402 and capacitor C1420 prevent 500-kc oscillations from coupling into the transmit bus. Diode CR1406 prevents reverse current flow through the emitter-base junction of Q1403. The frequency-modulated signal is coupled from the emitter of Q1403, through series dropping resistor R1431, to connector P1402. The signal is then coupled through a coaxial cable to mixer/amplifier Q501 in the variable IF amplifier module.

1-14. 150-Cps Tone and Security Injection Circuit

(fig. 1-3)

The fm modulator-oscillator is modulated by a 150-cps tone, coupled from pin 8 of P1401 through series resistor R1420 and coupling capacitor C1410 to the variable capacitor bias circuit. The tone is applied at the junction of resistors R1424 and R1426 to provide the proper tone injection level. Resistor R1420 and capacitor C1409 provide filtering. Security input is from pin 13 of P1401 through resistor R1422 and coupling capacitor C1411. Resistor R1421 and capacitor C1412 provide filtering. When the security input is used, the 150-cps tone is grounded through diode CR1404. *MWO 11-5821-244-30/2 is applied to provide Mode(X) Operation. (Fig. 6-10)*

1-15. Retransmit Interlock, K1401

(fig. 1-3)

Relay K1401, resistor R1433, diode CR1405, and capacitor C1423 form a retransmit control interlock circuit. The relay energizes, removing the

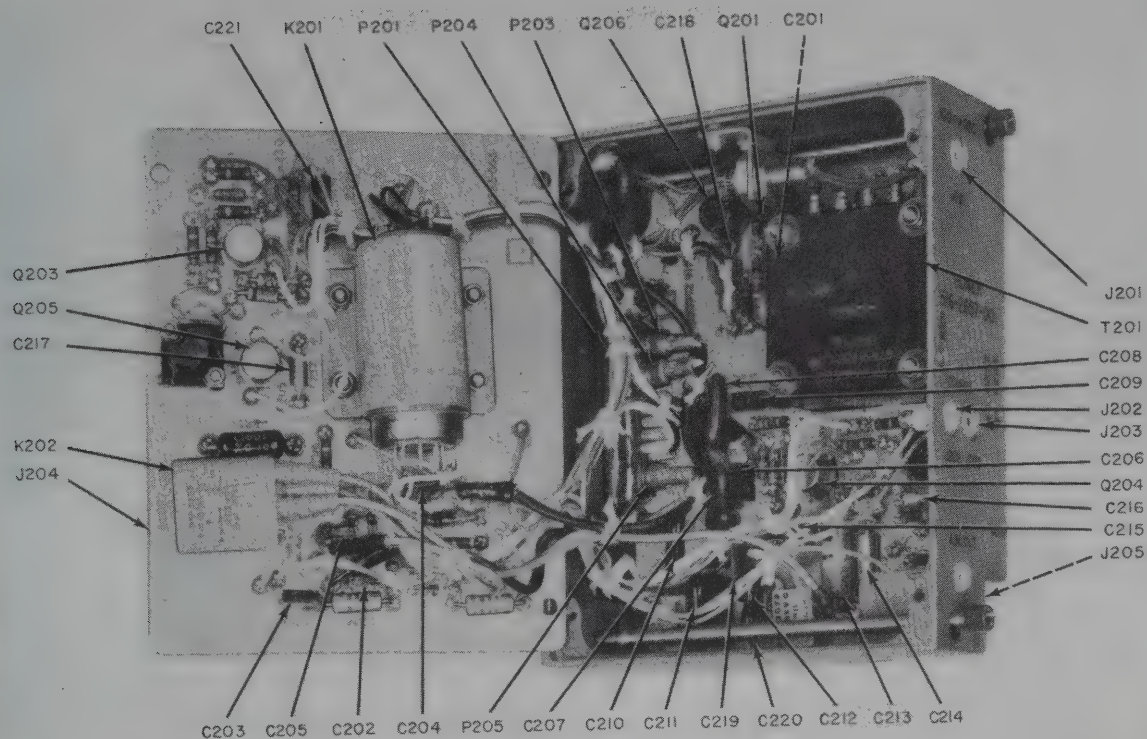
retransmit ground from pin 15 of P1401 when a transmit ground is applied at pin 2 of P1401. This assumes that, while one receiver-transmitter unit of a retransmit system is transmitting, the other receiver-transmitter unit will not transmit. When the ground is applied at pin 2 of P1401, energizing K1401, capacitor C1423 charges rapidly through diode CR1405. When the transmit ground is removed, the relay remains energized for a short time due to the relatively slow discharge of capacitor C1423 through relay winding and resistor R1433. The delay prevents retransmit oscillations. (Refer to paras. 1-92 and 1-93 for an overall discussion of retransmit operation.)

1-16. Lfo Diode Switch

(fig. 1-4)

The lfo diode switch selects the proper path for the low-frequency oscillator signal. The diodes are biased so that the low-frequency oscillator signal is coupled to mixer Q503 in the receive condition, and to mixer/amplifier Q501 in the transmit condition. The diode switch consists of diodes CR501 through CR507; capacitors C517, C536, C537, and C539; and resistors R519 through R526. Diode biasing voltage is supplied from the transmit-receive (tr) bus (pin B of connector J506). The tr bus voltage is +27.5 volts in the receive condition and -27.5 volts in the transmit condition.

a. Receive Condition. In the receive condition, the tr bus is +27.5 volts. Current flows through resistors R526 and R525. The resulting voltages at the cathode ends of diodes CR504 and CR506 are less positive than the voltages at the anode ends and CR504 and CR506 conduct through resistors R526, R523, and R522, completing a path for the low-frequency oscillator signal to be coupled, through coupling capacitors C536 and C538, to mixer transistor Q503. The voltages described above reverse-bias diodes CR507 and CR505 so that they do not couple the low-frequency oscillator signal to ground. Current flow through diodes CR506 and CR504 and resistors R526 and R522 causes a positive voltage at the cathode end of diode CR503. The anode end of CR503 is practically at ground potential because of conduction of diode CR502 through resistor R521. Diode CR503 is thus reverse-biased so that



NOTE:

CAPACITOR C221 NOT PRESENT IN
SETS WITH SERIAL NUMBERS
UNDER 1160

TM 5821-244-35-C1-186

Figure 4-23. Homer module, parts identification.

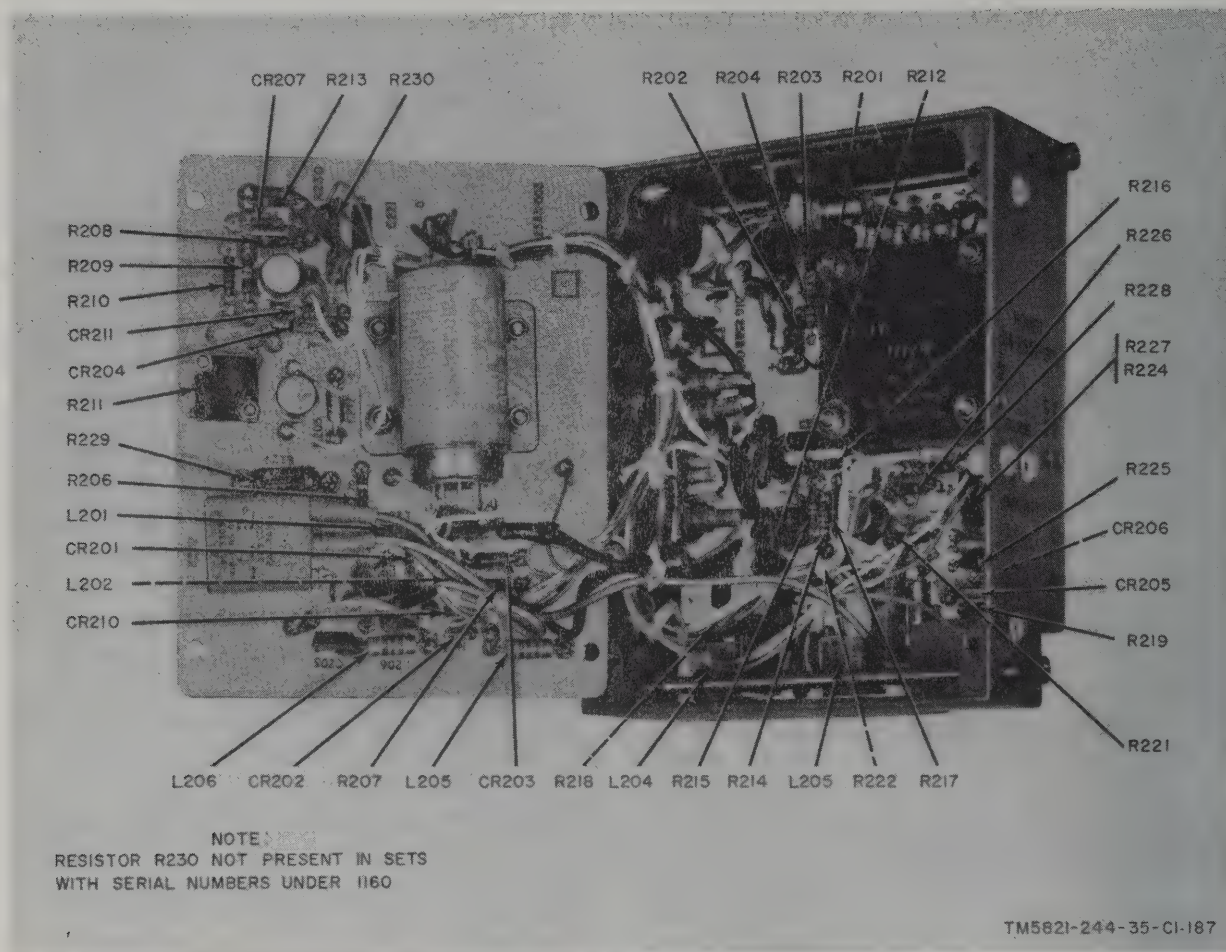


Figure 4-24. Homer module, additional parts identification.

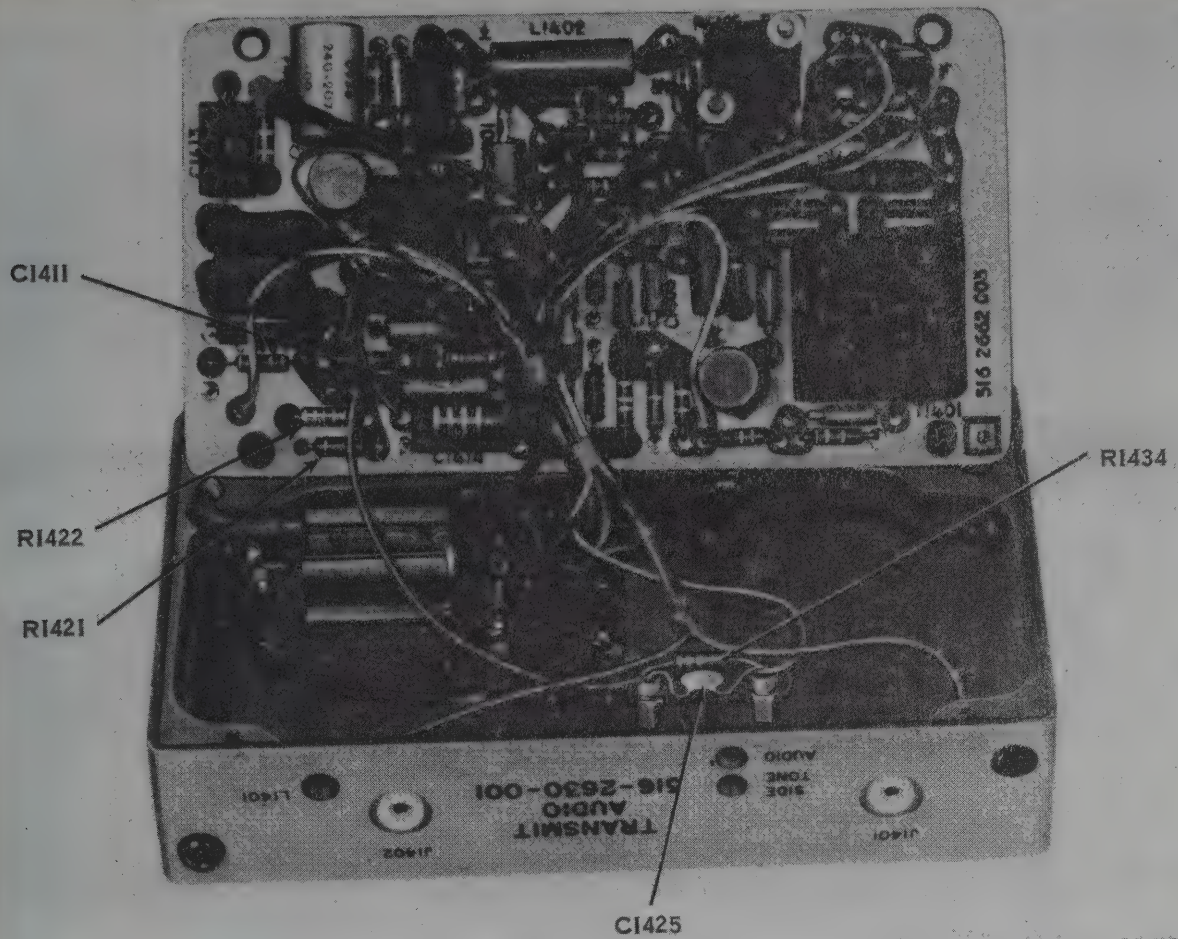
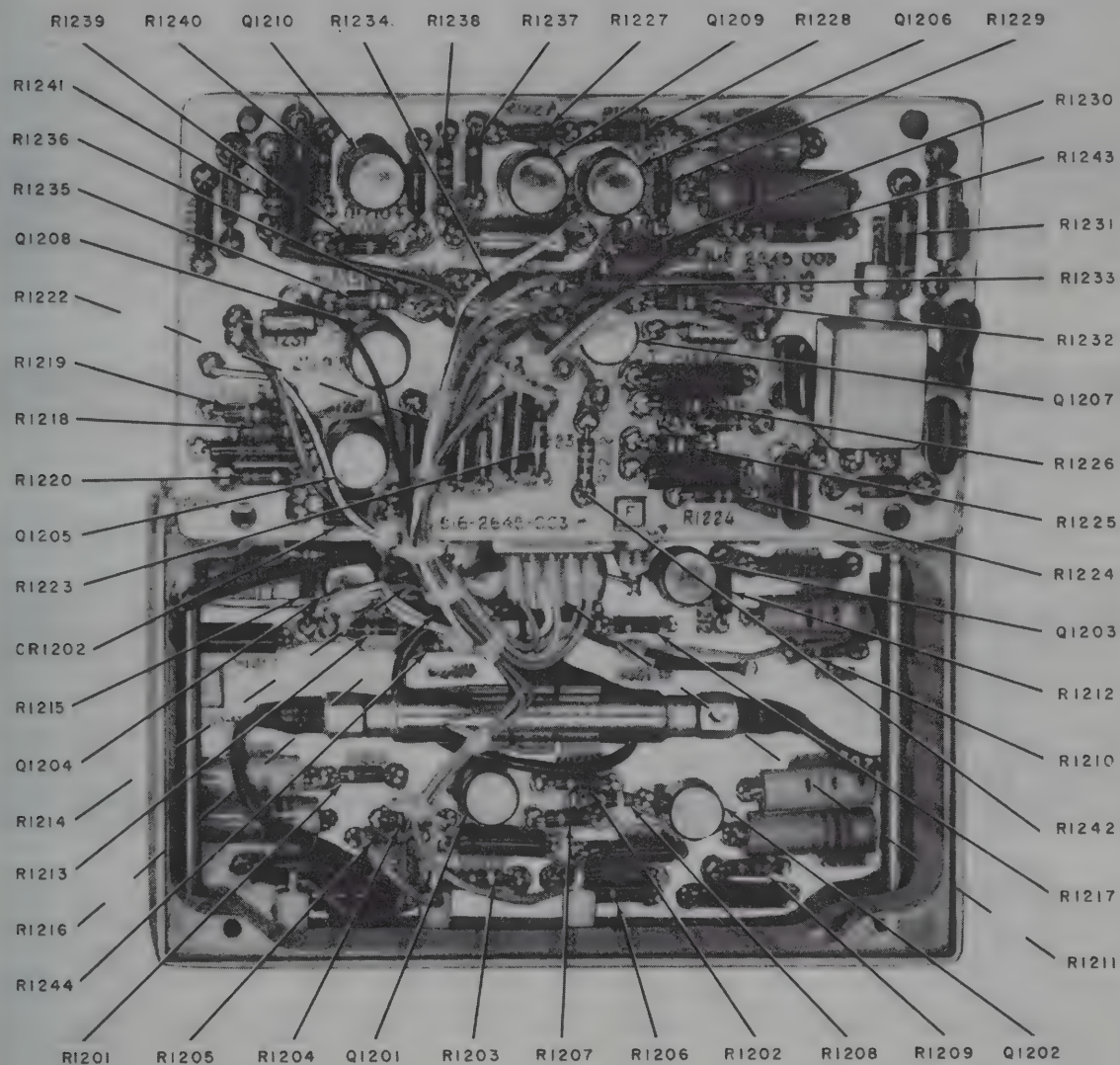


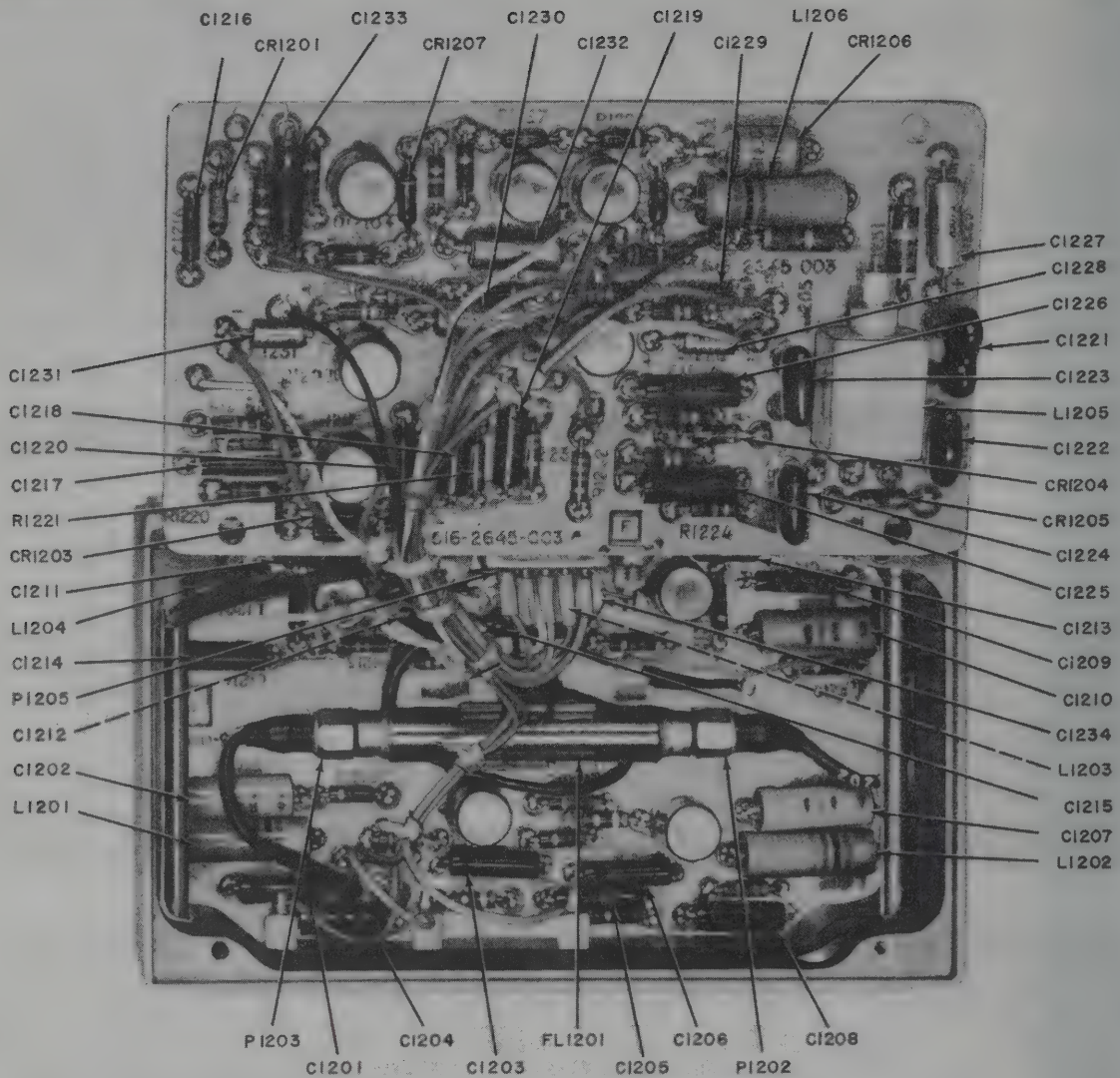
Figure 4-30.1 Transmit audio module showing mode X modification, parts identification.

TM 5821-244-35-C1-189



TM5821-244-35-C1-185

Figure 4-36. Fixed IF module, parts identification.

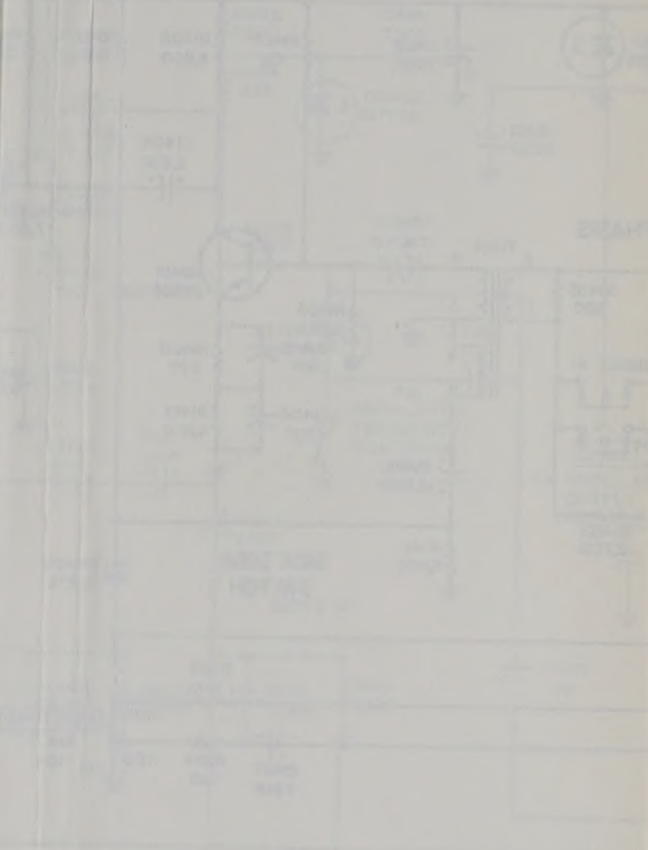


NOTE.
CAPACITOR C1234 NOT PRESENT
IN SETS WITH SERIAL NUMBERS
UNDER 1160

TM5821-244-35-C1-188

Figure 4-37. Fixed IF module, additional parts identification.

FIGURE 1. Schematic diagram of the system.





Page 11 of 11

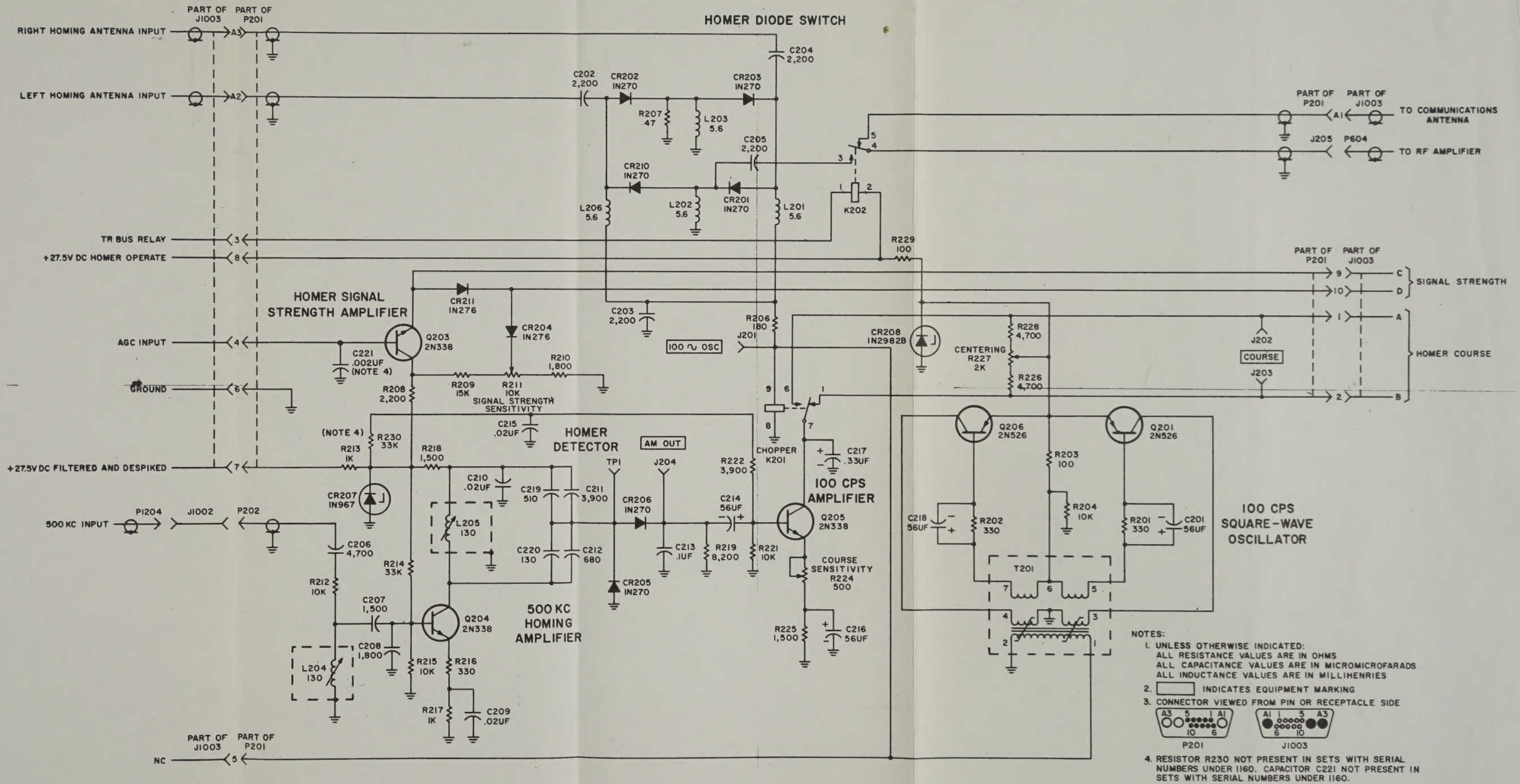
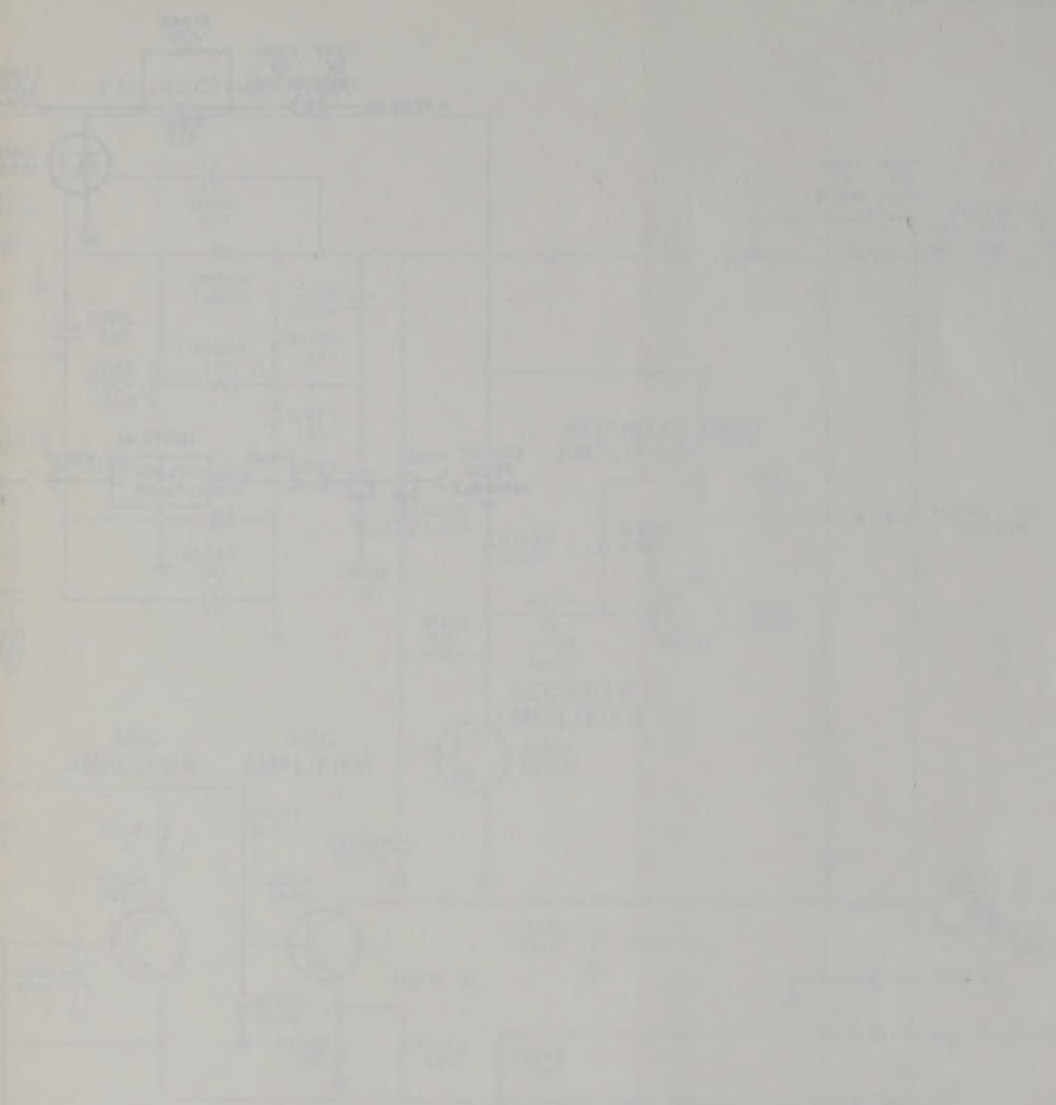


Figure 6-12. Homer module, schematic diagram.



1. The first section of the circuit is a power supply section, which includes a power transformer, a rectifier, and a filter. The power transformer is connected to the AC line, and the rectifier is connected to the secondary winding of the transformer. The filter is connected to the output of the rectifier and to ground.

2. The second section of the circuit is a pre-amplifier section, which includes a 6X4 tube. The 6X4 tube is connected to the output of the power supply section and to ground. The 6X4 tube is also connected to a 100K resistor and a 100K capacitor, which are connected to ground.

3. The third section of the circuit is a detector and amplifier section, which includes a 6X5 tube. The 6X5 tube is connected to the output of the pre-amplifier section and to ground. The 6X5 tube is also connected to a 100K resistor and a 100K capacitor, which are connected to ground.

4. The fourth section of the circuit is a push-pull amplifier section, which includes a 6X6 tube and a 6X7 tube. The 6X6 tube is connected to the output of the detector and amplifier section and to ground. The 6X7 tube is connected to the output of the 6X6 tube and to ground. The 6X6 tube is also connected to a 100K resistor and a 100K capacitor, which are connected to ground.

5. The fifth section of the circuit is a push-pull amplifier section, which includes a 6X8 tube and a 6X9 tube. The 6X8 tube is connected to the output of the 6X7 tube and to ground. The 6X9 tube is connected to the output of the 6X8 tube and to ground. The 6X8 tube is also connected to a 100K resistor and a 100K capacitor, which are connected to ground.

6. The sixth section of the circuit is a push-pull amplifier section, which includes a 6X10 tube and a 6X11 tube. The 6X10 tube is connected to the output of the 6X9 tube and to ground. The 6X11 tube is connected to the output of the 6X10 tube and to ground. The 6X10 tube is also connected to a 100K resistor and a 100K capacitor, which are connected to ground.

7. The seventh section of the circuit is a push-pull amplifier section, which includes a 6X12 tube and a 6X13 tube. The 6X12 tube is connected to the output of the 6X11 tube and to ground. The 6X13 tube is connected to the output of the 6X12 tube and to ground. The 6X12 tube is also connected to a 100K resistor and a 100K capacitor, which are connected to ground.

8. The eighth section of the circuit is a push-pull amplifier section, which includes a 6X14 tube and a 6X15 tube. The 6X14 tube is connected to the output of the 6X13 tube and to ground. The 6X15 tube is connected to the output of the 6X14 tube and to ground. The 6X14 tube is also connected to a 100K resistor and a 100K capacitor, which are connected to ground.

9. The ninth section of the circuit is a push-pull amplifier section, which includes a 6X16 tube and a 6X17 tube. The 6X16 tube is connected to the output of the 6X15 tube and to ground. The 6X17 tube is connected to the output of the 6X16 tube and to ground. The 6X16 tube is also connected to a 100K resistor and a 100K capacitor, which are connected to ground.

10. The tenth section of the circuit is a push-pull amplifier section, which includes a 6X18 tube and a 6X19 tube. The 6X18 tube is connected to the output of the 6X17 tube and to ground. The 6X19 tube is connected to the output of the 6X18 tube and to ground. The 6X18 tube is also connected to a 100K resistor and a 100K capacitor, which are connected to ground.